Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Use of Additional Digital Modes in the Amateur Radio Service	)	RM-3788
	)	

PETITION FOR RULE MAKING

The American Radio Relay League, Incorporated, the nation-wide non-profit organization of amateur radio operators and enthusiasts with more than 150,000 members in the United States licensed by the Commission, respectfully requests that the Commission amend its rules to permit the use of digital techniques in the amateur bands above 50 MHz in addition to the already authorized techniques using International Morse and Bandot codes, and the American Standard Code for Information Interchange (ASCII). It is apparent to the League that such rule making would facilitate and encourage amateur experimentation with new types of radio transmission, including but not limited to digital voice techniques, digitized video signals and computer to computer communications.

A Compelling Need Exists For The Use Of Additional Digital Techniques By Amateurs

1. It is now quite clear that digital techniques are the leading edge of the "state of the radio art." If radio amateurs

are to continue as the primary contributors to the advancement of that art, it will be necessary to permit them a wide scope of authority to conduct digital experiments than now exists.

2. Amateurs in other countries, perhaps with less formal rule making procedures, are already engaged in experimentation and operation with digital techniques other than Baudot and ASCII. In Canada, for example, packet networks are now being utilized. In the United Kingdom, a team at the University of Surrey is constructing Britain's first amateur satellite. The mission objective of the UOSAT spacecraft represents a departure from the traditional AMSAT-OSCAR satellites, the latter having been oriented predominantly towards providing improved long distance communications for amateur radio operators at vhf and uhf. UOSAT will complement the OSCAR series as an experimental and scientific amateur spacecraft. For instance, it is expected to utilize a synthesized-voice telemetry system. There will be an on-board microcomputer for image processing, telemetry and command management, and for data storage and dissemination. The UOSAT is scheduled for launch in September 1981 as part of the IRAS mission aboard a Thor-Delta rocket out of Vandenberg Air Force Base, California. Already, a simulation of the UOSAT slow-scan television image has been completed using TIROS-N image data. Just recently, the Department of Commerce in Canada, in association with the company that was ANIK-B, a commercial satellite, has given Canadian amateurs a voice channel on the spacecraft, for "packet" radio communications.

4. U.S. amateurs, too, are ready for today's technology. For instance, a group of amateurs which includes ARRL Director Dr. Donald C. Miller, W9NTP, have recently renewed a Special Temporary Authorization (STA) for experiments with "medium scan television", which allows a moving image yet can be accomplished in narrow bandwidths. The AMSAT-OSCAR group, led by its president, Dr. Tom Clark, W3IWI, in August 1980 received an STA for tests of digital phase shift keying F1 emissions. Both of those experiments are to be conducted in the high-frequency bands where world-wide propagation is often available; thus, in those cases, the cautious approach of an STA rather than an immediate rules change seemed appropriate. However, the urge to experiment, exemplified by these two amateur projects can be encouraged and assisted to a degree far greater than as is provided through the use of an STA, by the allowance of additional digital techniques as a matter of course on the bands above 50 MHz where typical propagation extends to a few hundred miles at most.

Use Of Additional Digital Techniques
By Amateurs Is Consonant With
The Communications Act And With The
Purposes Of The Amateur Service

5. It is incumbent on the Commission, pursuant to Section 303(g) of the Communications Act of 1934, to "study new uses for radio, provide for experimental uses of frequencies and generally encourage the larger and more effective use of radio in the

public interest." Perhaps the best medium for study of such new uses and experimental techniques is the amateur service, due to its large number of innovative, technically oriented members. Thus, responsive to the above mandate of the Communications Act, the Commission has recognized as a basis and purpose of the Amateur Radio Service the "continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art."[1/] In the Radio Regulations promulgated by the International Telecommunication Union, the Amateur Service is defined[2/] as "A service of self-training, intercommunication and technical investigation carried on by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest."[3/]

6. On January 30, 1980, the Commission adopted a Third Report and Order in Docket 20777, providing for and establishing rules governing the use of ASCII, thus amending Section 97.69 of its Rules. Therein, it was stated that:

> 5. In other comments, amateur operators expressed interest in using radioteleprinter codes other than Baudot or ASCII. Frequently cited examples were the Binary Coded Decimal (BCD), Extended Binary Coded Decimal

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1/ See Section 97.1(b) of the Commission's Rules.

2/ Article I, Section II.

3/ A similar definition appears in Section 97.3(a) of the Commission's Rules.

Interchange Code (EBCDIC), Moore and Correspondence (IBM Selectric) codes. It was also felt that the Commission should allow the use of various "computer" or "machine" languages for computer-to-computer communication; and that the rules should provide for experimentation in the use of "packet switching" techniques.
(Emphasis Added)

* * * * * *

7. Our intent in this proceeding was simply to expand the operating capabilities available to amateur radioteleprinter operators by providing for the use of ASCII. We find, however, that the comments generally go beyond our proposal and seek more or less total deregulation in the area of radioteleprinter operation. We are not necessarily opposed to such extensive deregulation; and we agree that it would be in perfect harmony with the basis and purpose of the Amateur Radio Service as articulated in Section 97.1 of the Rules. However, it is not clear that such an action would be consistent with Article 41 of the International Telecommunications Union (ITU) Regulations. 6/ Additional exploration is needed to verify the literal and implied intent of Article 41 in relation to international radioteleprinter communications.
(Emphasis Added)

* * * * * *

6/ A preliminary opinion on this matter is that Article 41, Section 2(1) (which states, in part, that "transmissions between amateur stations of different countries...shall be made in plain language") could be construed to allow the use of "standard" radioteleprinter codes for international communications, but no other type of radioteleprinter code, whether it be used for experimental purposes or otherwise. However, Article 41 does not appear to prohibit the use of an unlimited number of radioteleprinter codes domestically.
(Emphasis added).

Clearly, ample authority and precedent exists for a rule amendment to allow use of new, additional digital techniques in the VHF and UHF amateur bands, for domestic communications.

The League's Proposal

7. Given the above, the League proposes amendment of Section 97.69 of the rules, to read as follows:[4/]

§ 97.69 Digital transmission.

Subject to the special conditions contained in paragraphs (a) and (b) *and (c)* below, the use of the International Telegraphic Alphabet No. 2 (also known as the Baudot Code) and the American Standard Code for Information Interchange (ASCII) *and other digital techniques* may be used for such purposes as (but not restricted to) radio teleprinter communications, control of amateur radio stations, models and other objects, transfer of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems): provided that such operations are carried out in accordance with the other regulations set forth in this Part.

(a) Use of the International Telegraphic Alphabet No. 2 (Baudot Code) and subject to the following requirements:

* * * *

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange (ASCII) as defined in American National Standards Institute (ANSI) standard X3.4-1968).

(2) F1 emission shall be utilized on those frequencies between 3.5 and ~~21.25~~ *28.0* MHz where its use is permissible; and the sending speed shall not exceed 300 bauds. *A1 emission may also be used for ASCII where F1 is permitted.*

(3) On frequencies between 28.0 and 28.5, F1 emission may be used; and the sending speed thereof shall not exceed 1200 bauds.

4/ Words to be deleted have horizontal lines through them; suggested additional or changed wording appears in italics.

(4) F1, F2 and A2 emissions may be utilized on those frequencies between ~~28~~ *50* and 225 MHz where their use is permissible; and the sending speed shall not exceed ~~1200~~ *4800* bauds.

(5) F1, F2 and A2 emissions may be utilized on those frequencies above 420 MHz where their use is permissible; and the sending speed shall not exceed 19.6 kilobauds.

(c) Use of digital techniques in addition to Morse, Baudot or ASCII codes is permitted on all amateur frequencies above 50 MHz except those on which only A1 emission is permitted, subject to the following additional requirements:

(1) Bandwidth of a signal from a station using such digital techniques shall be no greater than that of a station using ASCII at the baud rate specified by Section 97.69(b)(3), (4) or (5), above for the band then in use.

(2) At the time a particular digital emission is first used from a given amateur station, an entry shall be made in the log of the station describing the system and the technique to be used, in sufficient detail so that such technique may be identified solely by that description. A similar entry shall be made when changes are to be made in the technique(s) in use.

(3) A station using such digital techniques shall identify the station in accordance with the requirements of Section 97.84 of these rules.

Discussion of Rule Proposals

8. Transmitters typically used for radiotelephony in the 50, 144 and 220 MHz amateur bands utilize phase or frequency modulation with a deviation of 5 kHz, and thus have a nominal bandwidth of 16 kHz. Under some techniques, it should be possible

for amateurs to transmit ASCII at 4800 baud, with a shift of 5440 Hertz, and produce a bandwidth well within the accepted norm of 16 kHz. To encourage experimentation both with ASCII and with other additional digital techniques, as no penalty in assumed bandwidth, we are proposing to raise the allowed ASCII speed (and by inference the bandwidth for other digital techniques) from 1200 bauds to 4800 bauds on these bands.

9. On frequencies above 420 MHz, speeds of 19.6 kilobauds are permitted with ASCII, producing a nominal bandwidth of about 40 kHz. (Other wideband techniques are also permitted in these bands.) Accordingly it would be possible under the proposed wording of Section 97.69(c)(1) to use additional digital techniques with similar nominal bandwidths.

Accountability

10. The Commission must consider the compliance prospects for any proposed rule changes. The League's proposal herein has been constructed with compliance in mind. First, the bands selected for additional digital experimentation and operation are above 50 MHz, where long distance communications are much less common than on the Amateur frequencies below 50 MHz. The League's present proposal is oriented toward domestic communications only. Normal identification procedures calling for identification at the beginning and end of every transmission or series of transmissions, in accordance with the requirements of §97.84 of the

Rules would be adhered to.[5/] These identifications will continue to be made either by telegraphy using the International Morse Code or by telephony, using the English language. The digital techniques in use will be described in detail in the station log, which must be available to the Commission for inspection, under the terms of Section 97.105 of the rules. A parallel situation has existed in the Amateur Rules for years, with respect to the use of foreign languages. The Commission has permitted its amateur licensees to use any foreign language so long as the identifications required by Section 97.84 have been given in English. Obviously, few amateurs and few of the lYmmission's monitoring staff are proficient in a variety of languages yet, so far as we are aware, few problems have arisen.

11. The Commission, on many occasions, has publicly commented on the generally high degree of amateur operator

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5/ Although the League currently proposes use of Morse or voice identification in connection with use of the additional digital techniques, it is felt that discussion and consideration of alternative methods of identification in digital transmission is appropriate. Morse or voice identification in the context of, for example, packet switch techniques is interruptive and can be quite cumbersome for the operator. Nonetheless, accountability concerns expressed by others form the basis of the League's proposal in this regard at this time.

with the rules relating to permissible communications;[6/] this has been the foundation of the deregulatory approach. Given the largely local characteristic of expected digital transmissions under these proposed rules on the vhf and uhf bands, and the continued open identification procedures, we feel confident that the Commission can, in the main, rely for the negligible amount of "policing" desirable in this area on the constructive curiosity of amateurs as to a digital signal in general, and specifically one which might seem to display non-standard operating habits.

12. The local character of such transmissions would have the additional practical effect of necessitating "interoperability" or operation in accordance with accepted technical standards, because of the need to communicate. Even those

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6/ For example, in the Third Report and Order, Docket 20777, supra, in connection with the suggestion that digital techniques in addition to ASCII be authorized, the Commission reported as follows:

> Recognizing that under such an approach, it would be impossible for the Commission's enforcement personnel to intercept all radioteleprinter transmissions, several of those filing comments pointed out that amateurs have repeatedly demonstrated their ability to enforce self-imposed standards, and recommended that the Commission take an approach of adopting generalized and non-specific rules which deal only with the general form, and not the content of transmissions. Reference is made to the generally high degree of amateur operator compliance with the rules relating to permissible communications as the foundation for this deregulatory approach.

oriented most toward experimentation would have the capability of conversion to more conventional "digital techniques" in short order, to facilitate coordination of experiments and to insure a wider range of stations to communicate with, especially in emergency contexts. It is thus anticipated that certain of the requested additional digital techniques will become more standardized as use of digital techniques increases. In short, the marketplace will determine which technique will prevail over time.

Conclusion

Wherefore, the premises considered, the American Radio Relay League, Incorporated respectfully requests that the Federal Communications Commission issue a Notice of Proposed Rule Making, proposing the amendment of its Rules to permit the use of additional digital techniques in the amateur bands above 50 MHz so as to provide for a wide range of digital experiments by amateurs, in furtherance of the purpose of

the amateur radio service. It is further urged that action hereon be considered a priority matter for Commission action as a clear signal of the Commission's support of amateur radio experimentation.

Respectfully submitted,

The American Radio Relay League, Incorporated

By Robert M Booth
Robert M. Booth, Jr.
General Counsel

225 Main Street
Newington, CT 06111
(203) 666-1541

Booth & Freret
1302 18th Street, N.W.
Washington, D.C. 20036
(202) 296-9100

October 21, 1980

COMMENTS ON FCC RM3788 -- DIGITAL MODES IN AMATEUR RADIO SERVICE

These comments on the American Radio Relay League's petition for rulemaking, RM-3788, concerning Additional Digital Modes in the Amateur Radio Service will be divided into two main parts. The first set of comments strongly supports the proposals outlined in the petition, and the second set of comments concern some technicalities in the rules of the Amateur Radio Service which should also be addressed but which are not covered in the petition as it was submitted.

1.0 Demand for Digital Techniques

This writer agrees completely that there is a strong need and desire within the amateur radio community for advanced digital communications techniques, and that there are many amateurs who are capable of making significant contributions to the development of the technology. There are a great number of amateur operators who own microcomputers, and we can expect an even greater number in the future. The equipment required to build reliable digital data communications systems is not prohibitively expensive, and within reach of many operators.

1.1 U. S. Technology Lagging

The U.S. technical community should be leading the way in developing this new technology of digital packet networks. It is not. Our enterprising Canadian friends have clearly taken the lead in developing packet networking techniques, and we find ourselves a year or more behind their current efforts. The level of discussion of these topics in U.S. radio magazines is primitive and appalling. The state of the art of amateur stations doing digital communications is, for the most part, twenty years behind current commercial practice. This gap, to some extent, developed because of obstructive Federal regulations which the petition hopes to redress.

1.2 Experimentation Required

The application of current commercial and industrial techniques to amateur practice is not obvious, and there is much room for experimentation and tailoring of these techniques for use by the radio amateur. Standards at this point in time would hinder many potential implementations and would be difficult to agree on. Already there are three or more techniques in use to implement packet networking, each having its own advantages and disadvantages. The ARRL proposal to document the mechanism in the log allows the freedom to innovate required, and should be supported.

1.3 Bandwidth Proposals Have Merit

One of the other main themes of the ARRL petition is that the Baud rate limits of stations using digital transmission should be increased. Certainly 1200 Baud seems almost infinitely faster than the previously common 45 Baud, but in fact this speed is not really adequate for use in carrier-sensed multiple-access channels, where the effective Baud rate is only a fraction of the maximum available Baud rate. Effective human interaction at a display terminal also demands rates higher than 1200 Baud. The increased transmission rates proposed by the ARRL would be most welcome and would definitely improve the character of the services possible on our frequencies.

2.0 Issues not Addressed

In addition to the topics addressed in the petition, there appears to be one area of current regulations which needs clarification and modification. The paragraphs which follow outline the problem in more detail.

2.1 When is a repeater a repeater?

In packet radio service there is a class of devices which will become increasingly common as more amateurs get involved in networking. These devices, called digital repeaters, are machines which receive a message or block of data, and after verification, retransmit that message on the same frequency channel where it was received. Thus, only a simplex channel is used, and the message transmitted is the same as the message received, except for the possible modification of some address or control bytes. The primary function of a packet repeater, as with a more conventional repeater, is to extend the geographic coverage of fixed or mobile stations. In additon, a packet repeater may control network services (and is then called a "station node") or it may do code or protocol conversion (and would be called a "network gateway"). Packet repeaters on the VHF and UHF bands will form the backbone of the networks serving the amateur community in the years to come.

So, the question arises, "Is a simplex packet repeater a 'repeater' as defined in the FCC rules?" The answer to this question is crucial because it determines what frequencies may be used in packet radio service. For example, it would be reasonable to use the non-satellite portion of 145.5-146.0, but "repeaters" are not permitted there. It should also be possible to use packet repeaters on frequencies in the HF bands. The spectrum reserved for conventional full-duplex voice repeaters is full in most major metropolitan areas, and we question whether packet repeaters should have to fight for the same frequency allocations.

The current rules define repeater operation as "Radiocommunication, other than auxilliary operation, for retransmitting automatically the radio signals of other amateur radio stations." There is a spectrum of opinion concerning whether a packet repeater fits the definition of repeater operation stated above.

A conservative opinion goes something like this: Of the various types of stations and services defined in the rules, "repeater" clearly is the best match, and thus digital repeaters must be in the repeater subbands.

A moderate opinion: The FCC never envisioned digital repeaters and the intent of the rules really is to control duplex machines. Use any frequency.

A radical opinion: A digital repeater is a remotely controlled object, a store-and-forward message box. The use of the word "repeater" in "packet repeater" is an unfortunate accident and should not be confused with the meaning of "repeater" as in the rules.

2.2 Recommendations

It is proposed that digital repeaters not be regulated in the same manner as conventional duplex voice repeaters, and that two sections of the rules be modified:

Section 97.3 (1)

Add to the definitions ....

Digital Repeater Operation. Radiocommunication for the purpose of retransmitting automatically the non-voice signals of other amateur radio stations, where input and output is on the same frequency.

Section 97.61 (c)

Add at the end of the section ...

These frequency restrictions do not apply to stations in digital repeater operation.

The FCC is encouraged to act favorably on the ARRL proposal. The modifications requested in the petition are both reasonable and necessary. We also hope that you carefully consider the recommendations stated above.

Respectfully submitted,

H S Magnuski

Dr. H. S. Magnuski, KA6M

assures there will be no further misunderstanding on this point.

3. Accordingly, the Private Land Mobile Radio Service Rules are amended to reflect that a licensee may install its assigned frequency(s) in any facility with whom the licensee must communicate in situations directly related to the imminent safety of life and property. In all cases where such arrangements are made, the licensee is responsible for taking the necessary precaution to assure the facilities are only used in accordance with our Rules and Regulations.

4. Since this rule is both a general statement of policy and a rule of agency procedure and practice, and because it promotes the general public safety and well being, we conclude, pursuant to 5 U.S.C. and 553 (b) and (d), that notice and public procedure thereon is unnecessary, and the rule change should become effective immediately.

5. Accordingly, it is ordered, effective August 27, 1982, that Part 90 of the Rules and Regulations is amended as set out in the Attached Appendix.

(Secs. 4, 303, 48 Stat., as amended, 1066, 1082; 47 U.S.C. 104, 303)

Federal Communications Commission.

Edward J. Minkel,

Managing Director.

PART 90—PRIVATE LAND MOBILE RADIO SERVICES

Part 90 of Chapter 1 of Title 47 of the Code of Federal Regulations is amended as follows:

Section 90.421 is amended by the addition of paragraph (k) as follows:

§ 90.421 Operation of mobile units in vehicles not under the control of the licensee.

* * * * *

(k) In addition to the above, frequencies assigned to licensees in the Private Land Mobile Radio Services may be installed in the facilities of those who assist the licensee in emergencies and with whom the licensee must communicate in situations involving imminent safety to life or property.

[FR Doc. 82-26702 Filed 9-28-82; 8:45 am]

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47 CFR Part 97

[PR Docket No. 81-699; RM-3788; FCC 82-413]

Use of Additional Digital Codes in the Amateur Radio Service

AGENCY: Federal Communications Commission.

ACTION: Final rule (Report and Order).

SUMMARY: The Commission is authorizing the use of digital codes, other than those specifically defined in the Rules, by amateur radio stations operating on frequencies above 50 MHz. Amateur radio operators have demonstrated a growing interest in experimentation with such codes and communications systems based upon them (e.g. Packet Switching Systems). The broad deregulation being ordered in this proceeding will eliminate many constraints on the use of digital codes for experimentation and communication. Other related regulations regarding digital communications are also being relaxed.

DATES: Effective October 28, 1982.

ADDRESS: Federal Communications Commission, Washington, DC 20554.

FOR FURTHER INFORMATION CONTACT: Steve Lett, Private Radio Bureau, Special Services Division, (202) 632-4964

SUPPLEMENTARY INFORMATION:

List of Subjects in 47 CFR Part 97

Radio.

Report and Order

(Proceeding Terminated)

Adopted: September 14, 1982.

Released: September 21, 1982.

1. On October 1, 1981 the Commission adopted a Notice of Proposed Rule Making [1] in the above-captioned matter proposing to allow amateur radio stations to use digital codes, other than those specified by the Commission, on amateur radio frequencies above 50 MHz. That Notice was in response to a petition for rule making, RM-3788 submitted by the American Radio Relay League, Incorporated (ARRL), which seeks amendment of the Amateur Radio Service Rules (Part 97) to provide for the use of any digital encoding technique in the amateur radio frequency bands above 50 MHz. Currently, the Rules only permit the use of the International Telegraphic Alphabet Number 2 (Raudot code) and the American Standard Code for Information Interchange (ASCII code). The comment period for the Notice ended January 15, 1982 and the reply comment period ended February 15, 1982.

2. In its Notice of Proposed Rule Making, the Commission specifically proposed to permit the transmission of digital codes, other than those defined in the Rules, on all amateur radio frequencies above 50 MHz, with the exception of those frequencies designated for A1 emissions only (50.0-50.1 MHz and 144.0-144.1 MHz). It was also proposed to limit communications using such codes to those between points within areas regulated by the FCC (domestic operation). Requirements that a station licensee include a description of the unspecified digital code in the station records and that the licensee, upon direction of the Commission, cease or restrict the use of the code, or maintain a record of coded communications, were also included in the proposal. In related areas, the Notice proposed to raise the maximum sending speed for ASCII coded communications from 1200 baud to approximately 19.6 kilobaud on amateur radio frequencies between 50 and 225 MHz; but it was also proposed to specify this higher speed, as well as all other sending speeds, in terms of "bits per second." The proposal included bandwidth specifications for transmissions of ASCII coded communications between 50 and 225 MHz, and for all transmissions of communications using unspecified digital codes. Finally the Commission proposed to allow the use of A1 emissions for the transmission of ASCII coded communications on frequencies between 3.5 and 28 MHz.

3. Virtually all of the comments on the Notice support the Commission's proposal, however many suggest minor modifications. John A. Carroll, in his comments, quotes the following portion of the Commission's Notice: "We believe that other unspecified digital coding techniques may also lend themselves to digital voice, facsimile, and television communications. As such uses are not currently prohibited by the rules, the Commission does not see a need to restrict these uses for the unspecified digital codes." John A. Carroll's comments goes on to state that certain of these uses have "* * * enormous potential for improved communication, especially relay communication * * *" and that "* * * it would be well to add a few extra words (to the final rules) so that there is no doubt (this) intent." Since the Commission desires to set forth the rules in the clearest possible manner and also desires to foster experimentation in the Amateur Radio Service, we are including such additional language in the final rules.

4. With regard to our proposal that communications using unspecified digital codes be limited to domestic operation only, the ARRL, petitioner in RM-3788, states in its comments, "There is at present a great deal of interest in linking together packet repeaters between Canada and the United States. The League would suggest that the final rules for additional digital codes provide that, should the governments of, for

[1] 46 FR 50993, October 16, 1981.

example, Canada and the United States specifically so agree, VHF or UHF digital communications across national borders shall be permitted." The Commission recognizes the potential desirability of such intercommunication and accordingly the final rules have been fashioned in such a way as to not preclude the use of unspecified digital codes across borders of consenting countries.

5. Several commenters express concern that the proposed rules allowing the Engineers-in-Charge (EICs) of field facilities to restrict the use of unspecified digital codes, or require maintenance of a record of the communications, might be imposed indiscriminately or without due consideration of the burden involved. The comments of the ARRL state, "While the need for this available sanction is manifest * * * the practicality of compliance with such a sanction is of some concern. Conversion of a digitized image or voice transmission or the contents of a computer memory into plain language may be dificult to accomplish." The ARRL also expresses concern that "* * * the potential requirement that an amateur maintain a record * * * of all coded transmissions from the station with which communication is established may be burdensome in certain cases." John A. Carroll's comments state that "* * * high speed digital communication could rapidly generate a large amount of communicated information, which, by Amateur standards, would be prohibitively costly to file." His comments also state that "(t)his is not to suggest that the provision shouldn't be there; (it would be) an important contribution to effective enforcement * * * (but) it would be desirable to indicate how this authority is intended to be used."

6. The Commission is sympathetic to these concerns and we are including language in the final rules which states that the authority being granted to the EICs to limit unspecified coding, or require maintenance of a record, may only be invoked when "* * * necessary * * * to assure compliance with the rules. * * *" We are also deleting from the final rules the proposal that the EICs be authorized to require the recording of communications from a station with which communications are established using unspecified digital codes.

7. Also with regard to the authority the Commission proposed granting the EICs, the comments of Paul Newland state, "The proposal * * * is well reasoned and more than fair * * * (however it) doesn't include any recourse for the amateur who has been directed to cease (unspecifically coded) transmissions permanently. I would like to see a hearing (or some other process) as a next step in resolving * * * a shut-down order." In fact, the appeal process which applies to virtually all Commission actions will also apply to this delegation of authority to the EICs. An amateur operator aggrieved by invocation of that authority may file an application for review or a petition for reconsideration of the action.[2]

8. The sentiment of the comments is unanimously against the Commission's proposal to replace the term "baud" in the rules limiting sending speeds, with the term "bits per second." Representative of this sentiment are the comments of Robert J. Carpenter which state, "If two bits are coded into a single time element (four level coding) the number of 'bits per second' is twice the number of 'bauds,' but the bandwidth occupied has not increased. I feel certain that the Commission intends to control the characteristic which relates to occupied bandwidth (bauds) * * *" Indeed, the Commission's interest is in maintaining spectrum efficiency through limitations on bandwidth. And since we do not want to close off "* * * a prime area of legitimate technical interest and experimentation by amateurs * * *"[3] we are going to continue to specify maximum sending speeds with the term "baud" so that amateur operators can utilize multi-level coding without incurring a sending speed penalty. We are adding a sending speed definition to the rules to make the Commission's intent in this area clear.

9. Several comments express a desire for the Commission to allow sending speeds greater than those proposed in the Notice for ASCII coded communications in the VHF[4] and higher frequency bands. Those comments also request a commensurate increase in the bandwidth authorized for unspecified digital codes. The comments of Paul Newland suggest that techniques such as *"Time-Division Multiplex (TDM)"* could be used so that "* * * more users could benefit by allowing digital transmissions to occupy a bandwidth greater than the Commission had initially planned to allocate." The Amateur Radio Research and Development Corporation (AMRAD) states in its comments that "(t)he highest permissible ASCII sending speed and bandwidth should be raised to 56 kilobits per second and 100 kHz respectively in the 220.5 to 221.9 MHz subband to permit packet switching network operations in that subband." The reply comments of the ARRL state, "The League shares the concerns of Messrs. Ranaldo (for AMRAD) and Newland, and suggests that the Commission increase permissible bandwidths for digital transmissions at and above 220 MHz."

10. The Commission appreciates the desire of the amateur community to experiment and operate with state-of-the-art digital technology. Therefore, in order to avoid hampering these endeavors we are authorizing greater ASCII sending speeds and the use of wider bandwidths for unspecified coded transmissions. We are authorizing a sending speed as great as 56 kilobaud and a bandwidth as great as 100 kHz in accordance with the request of AMRAD; however, in order to permit the greatest flexibility in spectrum utilization, we are going to permit this speed and bandwidth on all frequencies above 220 MHz rather than limiting them to the frequencies between 220.5 and 221.9 MHz. Furthermore, the final rules will allow the use of any bandwidth on frequencies above 1215 MHz rather than imposing a limitation as was proposed in the Notice. The Commission is also not adopting the bandwidth restriction proposed for transmissions of ASCII coded communications on frequencies between 50 and 225 MHz, using sending speeds between 1200 and 19600 bits per second. Instead we will allow a maximum sending speed on the frequencies between 50 and 220 MHz of 19.6 kilobaud without a bandwidth restriction. The maximum speed of 56 kilobaud will apply to the frequencies between 220 and 225 MHz as discussed earlier. We are raising the permissible bandwidth for transmissions of unspecifically coded communications between 50 and 220 MHz from 16 kHz to 20 kHz in order to fit more closely our desire to equate these emissions with the ones currently used in those bands.

11. The Commission is also including some other minor changes in the final rules regarding sending speed and bandwidth. We are revising our bandwidth definition to eliminate certain ambiguities in the definition we proposed in the Notice. We wish to emphasize that this definition does not imply, nor do we intend to require, that amateur radio operators continuously monitor their emission bandwidth while using the digital codes which subject the station transmissions to bandwidth

[2] See §§ 1.106 and 1.115 of the Commission's Rules; also Section 5, paragraph (d)(4), and Section 405 of the Communications Act of 1934, as amended.

[3] Comments of the American Radio Relay League, Incorporated.

[4] The Very High Frequencies (VHF) are those between 30 and 300 MHz.

limitations. We only require that operators comply with the bandwidth requirements. Operators may determine compliance through electronic, mathematical or any other means they deem sufficient. We are also eliminating the requirement that stations using the Baudot code maintain the sending speed within certain tolerances. Currently, the sending speed must be maintained within 5 words per minute of the standard speeds (60, 67, 75 or 100 words per minute). However, that requirement no longer serves any regulatory purpose since electronic rather than electro-mechanical teleprinter equipment is now commonly used and the newer equipment is less sensitive to variations in sending speed.

12. As another minor change, the Commission is authorizing the use of A1 emissions for ASCII coded communications on all frequencies where F1 emissions are permitted. We had proposed to limit the use of A1 emissions for ASCII coding to the frequencies below 28 MHz, however we can find no reason not to permit this additional mode in the bands above 28 MHz as well. A small amendment to the rules regarding operator privileges is being added to preclude the use of ASCII coded communications by Novice class and Technician class operators using frequencies below 28.2 MHz. This represents no change in privileges for these operators.

13. Finally, with regard to the authorization of unspecified digital codes, concern was expressed in the Commission's Notice that such an authorization could affect ". . . our ability to monitor coded transmissions for content, as well as the ability of the amateur community to monitor transmissions from individual stations for the purpose of self-enforcement." In response to this concern the comments of the ARRL state the following:

> The League is sympathetic to, and generally shares the Commission's reservations about any reduction in the Commission's ability to monitor coded transmissions for content, or the amateur's ability to monitor for purposes of self-enforcement. A combination of several factors should be sufficient to minimize the potential for abuse, however. First, the primarily local nature of communications on the VHF and UHF frequencies involved should limit the potential ability of unscrupulous business users to utilize the amateur bands to transmit data of a commercial nature, circumventing existing common carriers. Second, the vigor with which amateurs protect their allocated frequency bands against unauthorized interlopers, together with well-polished direction finding techniques, will in most cases result in investigation by amateurs of the source of repeated unusual or suspicious digital transmissions. The requirement of open identification procedures is a significant litmus for distinguishing legitimate amateur use from unlawful misuse of amateur frequencies. Finally, the provisions of proposed Rules Section 97.69(c)(3) permit the Commission to take immediate action against a station suspected of unlawful misuse of the amateur bands via unspecified digital codes by ordering the cessation of the use of such codes. The above factors, together with the traditionally superlative level of rule compliance by amateurs, should be sufficient to offset the League's concern and that of the Commission with respect to potential misuse of digital codes.

We have considered this matter at great length. In balancing our objectives of encouraging new technologies against assuring our enforcement capability, it must be recognized that there is an incompatibility between authorizing experimentation with "exotic" technologies and the employment of channel monitoring as an enforcement tool. Our ability to verify that the content of messages complies with our rule requirements will be hindered by the broad relaxation of regulatory constraints that we are ordering in this proceeding. However, the Commission finds itself in agreement with the ARRL that special provisions we are including in the final rules, as well as existing provisions that identification be made in plain English or the international Morse code, should, when combined with the zealous effort of the amateur community to protect their allocated frequency bands, provide adequate protection against unauthorized operation in the service.

14. Accordingly, it is ordered that effective October 28, 1982, Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, is amended as set forth in the attached Appendix. It is further ordered that to the extent specified herein, RM-3788 is granted, and in all other respects it is denied. It is further ordered that this proceeding is terminated. This action is taken pursuant to authority contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended. In accordance with the Paperwork Reduction Act of 1980 (Pub. L. 96-511, December 11, 1980), the Commission will forward a copy of the final rules herein promulgated to the Associate Director for Information and Regulatory Affairs of the Office of Management and Budget. Further information on this matter may be obtained by contacting: Steve Lett, (202) 632-4964, Private Radio Bureau, Federal Communications Commission, Washington, DC 20554.

(Secs. 4, 303, 48 stat., as amended, 1066, 1082; 47 U.S.C. 154, 303)

Federal Communications Commission.

William J. Tricarico,

Secretary.

Appendix

PART 97—AMATEUR RADIO SERVICE

Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, is amended as follows:

1. In § 97.7, paragraph (e) is revised to read as follows:

§ 97.7 Privileges of operator licenses.

* * * * *

(e) *Novice Class.* Radiotelegraphy in the frequency bands 3700–3750 kHz, 7100–7150 kHz (7050–7075 kHz when the terrestrial station location is not within Region 2), 21,100–21,200 kHz, and 28,100–28,200 kHz, using only type A1 emission and using only the international Morse code.

2. Section 97.69 is revised to read as follows:

§ 97.69 Digital communications.

Subject to the special conditions contained in paragraphs (a), (b) and (c) of this section, an amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements or other information. These digitial codes may be used for such communications as (but not limited to) radio teleprinter, voice, facsimile, television, communications to control amateur radio stations, models and other objects, transference of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such digital codes are not intended to obscure the meaning of, but are only to facilitate, the communications, and further provided that such operation is carried out in accordance with other regulations set forth in this part. (For purposes of this section, the sending speed (signaling rate), in baud, is defined as the reciprocal of the shortest (signaling) time interval (in seconds) that occurs during a transmission, where each time interval is the period between changes of transmitter state (including changes in emission amplitude, frequency, phase, or combination of these, as authorized).)

(a) Use of the International Telegraphic Alphabet No. 2 (Baudot code) is subject to the following requirements:

(1) Transmission shall consist of a single channel, five unit (start-stop) teleprinter code conforming to the International Telegraphic Alphabet No.

2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in the "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The sending speed shall not exceed 100 words per minute (75 baud).

(3) When frequency (or phase) shift keying (type F1 emission) is utilized, the deviation from the mark signal to the space signal, or from the space signal to the mark signal, shall be less than 900 hertz.

(4) When audio frequency shift keying (type A2 or F2 emissions) is utilized, the highest fundamental modulating frequency shall not exceed 3000 hertz, and the difference between the modulating audio frequency for the mark signal and that for the space signal shall be less than 900 hertz.

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange as defined in American National Standards Institute (ANSI) Standard X3.4–1968.

(2) F1 emission shall be utilized on those frequencies between 3.5 and 29 MHz where its use is permitted; and the sending speed shall not exceed 300 baud.

(3) F1, F2 and A2 emissions may be utilized on those frequencies above 28 MHz where their use is permitted; and the sending speed shall not exceed the following:

(i) 1200 baud on frequencies between 28 and 50 MHz;

(ii) 19.6 kilobaud on frequencies between 50 and 220 MHz;

(iii) 56 kilobaud on frequencies above 220 MHz.

(4) A1 emission may be used for ASCII where F1 is permitted; and the sending speed shall not exceed that specified for other ASCII coded emissions on the same frequency.

(c) In addition to the above provisions, the use of any digital code is permitted on amateur frequencies above 50 MHz, except those on which only A1 emission is permitted, subject to the following requirements:

(1) Communications using such digital codes are authorized for domestic operation only (communications between points within areas where radio services are regulated by the U.S. Federal Communications Commission), except when special arrangements have been made between the United States and the administration of any other country concerned.

(2) The bandwidth of an emission from a station using such digital codes shall not exceed the following (where for this purpose the bandwidth is defined as the width of the frequency band, outside of which the mean power of any emission is attenuated by at least 26 decibels below the mean power of the total emission; a 3 kHz sampling bandwidth being used by the FCC in making this determination):

(i) 20 kHz on frequencies between 50 and 220 MHz;

(ii) 100 kHz on frequencies between 220 and 1215 MHz;

(iii) On frequencies above 1215 MHz any bandwidth may be used provided that the emission is in accordance with § 97.63(b) and § 97.73(c).

(3) A description of the digital code and the modulation technique shall be included in the station log during all periods of use and shall be provided to the Commission on request.

(4) When deemed necessary by an Engineer-in-Charge of a Commission field facility to assure compliance with the rules of this part, a station licensee shall:

(i) Cease the transmission of digital codes authorized under this paragraph.

(ii) Restrict the transmission of digital codes authorized under this paragraph to the extent instructed.

(iii) Maintain a record, convertible to the original information (voice, text, image, etc.), of all coded communications transmitted under authority of this paragraph.

[FR Doc. 82–26802 Filed 9–28–82; 8:45 am]
BILLING CODE 6712–01–M

INTERSTATE COMMERCE COMMISSION

49 CFR Part 1033

[Eleventh Revised S.O. No. 1474, Amdt. No. 3]

Various Railroads Authorized To Use Tracks and/or Facilities of Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

AGENCY: Interstate Commerce Commission.

ACTION: Amendment No. 3 To Eleventh Revised Service Order No. 1474.

SUMMARY: Pursuant to Section 122 of the Rock Island Railroad Transition and Employee Assistance Act, Pub. L. 96–254, this order authorizes various railroads to provide interim service over the Chicago, Milwaukee, St. Paul and Pacific Railroad Company, Debtor (Richard B. Ogilvie), Trustee, and to use such tracks and facilities as are necessary for operations. This order permits carriers to continue to provide service to shippers which would otherwise be deprived of essential rail transportation.

EFFECTIVE: 11:59 p.m., September 30, 1982, and continuing in effect until 11:59 p.m., December 31, 1982, unless otherwise modified, amended or vacated by order of this Commission.

FOR FURTHER INFORMATION CONTACT: M. F. Clemens, Jr., (202) 275–1559.

SUPPLEMENTARY INFORMATION:

Decided: September 23, 1982.

Upon further consideration of Eleventh Revised Service Order No. 1474 (47 FR 13529, 22963 and 32723), and good cause appearing therefor:

§ 1033.1474 [Amended]

It is ordered, that § 1033.1474 *Various railroads authorized to use tracks and/or facilities of the Chicago, Milwaukee, St. Paul and Pacific Railroad Company, debtor (Richard B. Ogilvie, trustee),* Eleventh Revised Service Order No. 1474 is amended by substituting the following paragraph (n) for paragraph (n) thereof:

(n) *Expiration date.* The provisions of this order are extended for an additional ninety (90) days, and shall expire at 11:59 p.m., December 31, 1982, unless otherwise modified, amended or vacated by order of this Commission.

Effective date. This amendment shall become effective at 11.59 p.m., September 30, 1982.

(49 U.S.C. 10304–10305 and Sec. 122, Pub. L. 96–254)

This amendment shall be served upon the Association of American Railroads, Transportation Division, as agent of the railroads subscribing to the car service and car hire agreement under the terms of that agreement and upon the American Short Line Railroad Association. Notice of this amendment shall be given to the general public by depositing a copy in the Office of the Secretary of the Commission at Washington, D.C., and by filing a copy with the Director, Office of the Federal Register.

List of Subjects in 49 CFR Part 1033

Railroads.

By the Commission, Railroad Service Board, members J. Warren McFarland, Bernard Gaillard, and John H. O'Brien. J. Warrent McFarland not participating.

Agatha L. Mergenovich,
Secretary.

[FR Doc. 82–26803 Filed 9–28–82; 8:45 am]
BILLING CODE 7035–01–M

Before the
Federal Communications Commission
Washington, D. C. 20554

PR
FCC 82-413
32009

In the Matter of	)	
	)	PR Docket No. 81-699
Use of Additional Digital Codes	)	RM-3788
in the Amateur Radio Service.	)	

REPORT AND ORDER
(Proceeding Terminated)

Adopted: September 14, 1982 Released: September 21, 1982

By the Commission

1. On October 1, 1981 the Commission adopted a Notice of Proposed Rule Making 1/ in the above-captioned matter proposing to allow amateur radio stations to use digital codes, other than those specified by the Commission, on amateur radio frequencies above 50 MHz. That Notice was in response to a petition for rule making, RM-3788 submitted by the American Radio Relay League, Incorporated (ARRL), which seeks amendment of the Amateur Radio Service Rules (Part 97) to provide for the use of any digital encoding technique in the amateur radio frequency bands above 50 MHz. Currently, the Rules only permit the use of the International Telegraphic Alphabet Number 2 (Baudot code) and the American Standard Code for Information Interchange (ASCII code). The comment period for the Notice ended January 15, 1982 and the reply comment period ended February 15, 1982.

2. In its Notice of Proposed Rule Making, the Commission specifically proposed to permit the transmission of digital codes, other than those defined in the Rules, on all amateur radio frequencies above 50 MHz, with the exception of those frequencies designated for A1 emissions only (50.0 - 50.1 MHz and 144.0 - 144.1 MHz). It was also proposed to limit communications using such codes to those between points within areas regulated by the FCC (domestic operation). Requirements that a station licensee include a description of the unspecified digital code in the station records and that the licensee, upon direction of the Commission, cease or restrict the use of the code, or maintain a record of coded communications, were also included in the proposal. In related areas, the Notice proposed to raise the maximum sending speed for ASCII coded communications from 1200 baud to approximately 19.6 kilobaud on amateur radio frequencies between 50 and 225 MHz; but it was also proposed to specify this higher speed, as well as all other sending

1/ 46 FR 50993, October 16, 1981.

speeds, in terms of "bits per second." The proposal included bandwidth specifications for transmissions of ASCII coded communications between 50 and 225 MHz, and for all transmissions of communications using unspecified digital codes. Finally, the Commission proposed to allow the use of A1 emissions for the transmission of ASCII coded communications on frequencies between 3.5 and 28 MHz.

3. Virtually all of the comments on the Notice support the Commission's proposal, however many suggest minor modifications. John A. Carroll, in his comments, quotes the following portion of the Commission's Notice: "We believe that other unspecified digital coding techniques may also lend themselves to digital voice, facsimile, and television communications. As such uses are not currently prohibited by the rules, the Commission does not see a need to restrict these uses for the unspecified digital codes." John A. Carroll's comment goes on to state that certain of these uses have "... enormous potential for improved communication, especially relay communication...." and that "... it would be well to add a few extra words (to the final rules) so that there is no doubt about (this) intent." Since the Commission desires to set forth the rules in the clearest possible manner and also desires to foster experimentation in the Amateur Radio Service, we are including such additional language in the final rules.

4. With regard to our proposal that communications using unspecified digital codes be limited to domestic operation only, the ARRL, petitioner in RM-3788, states in its comments, "There is at present a great deal of interest in linking together packet repeaters between Canada and the United States. The League would suggest that the final rules for additional digital codes provide that, should the governments of, for example, Canada and the United States specifically so agree, VHF or UHF digital communications across national borders shall be permitted." The Commission recognizes the potential desirability of such intercommunication and accordingly the final rules have been fashioned in such a way as to not preclude the use of unspecified digital codes across borders of consenting countries.

5. Several commenters express concern that the proposed rules allowing the Engineers-in-Charge (EICs) of field facilities to restrict the use of unspecified digital codes, or require maintenance of a record of the communications, might be imposed indiscriminately or without due consideration of the burden involved. The comments of the ARRL state, "While the need for this available sanction is manifest ... the practicality of compliance with such a sanction is of some concern. Conversion of a digitized image or voice transmission or the contents of a computer memory into plain language may be difficult to accomplish." The ARRL also expresses concern that "... the potential requirement that an amateur maintain a record ... of all coded transmissions from the station with which communication is established may be burdensome in certain cases." John A. Carroll's comments state that "... high speed digital communication could rapidly generate a large amount of communicated information, which, by Amateur standards, would be prohibitively costly to file." His comments also state that "(t)his is not to suggest that the provision shouldn't be there; (it would be) an important contribution to effective enforcement ... (but) it would be desirable to indicate how this authority is intended to be used."

6. The Commission is sympathetic to these concerns and we are including language in the final rules which states that the authority being granted to the EICs to limit unspecified coding, or require maintenance of a record, may only be invoked when "... necessary ... to assure compliance with the rules...." We are also deleting from the final rules the proposal that the EICs be authorized to require the recording of communications from a station with which communications are established using unspecified digital codes.

7. Also with regard to the authority the Commission proposed granting the EICs, the comments of Paul Newland state, "The proposal ... is well reasoned and more than fair ... (however it) doesn't include any recourse for the amateur who has been directed to cease (unspecifically coded) transmissions permanently. I would like to see a hearing (or some other process) as a next step in resolving ... a shut-down order." In fact, the appeal process which applies to virtually all Commission actions will also apply to this delegation of authority to the EICs. An amateur operator aggrieved by invocation of that authority may file an application for review or a petition for reconsideration of the action. 2/

8. The sentiment of the comments is unanimously against the Commission's proposal to replace the term "baud" in the rules limiting sending speeds, with the term "bits per second." Representative of this sentiment are the comments of Robert J. Carpenter which state, "If two bits are coded into a single time element (four level coding) the number of 'bits per second' is twice the number of 'bauds,' but the bandwidth occupied has not increased. I feel certain that the Commission intends to control the characteristic which relates to occupied bandwidth (bauds)...." Indeed, the Commission's interest is in maintaining spectrum efficiency through limitations on bandwidth. And since we do not want to close off "... a prime area of legitimate technical interest and experimentation by amateurs ..." 3/ we are going to continue to specify maximum sending speeds with the term "baud" so that amateur operators can utilize multi-level coding without incurring a sending speed penalty. We are adding a sending speed definition to the rules to make the Commission's intent in this area clear.

9. Several comments express a desire for the Commission to allow sending speeds greater than those proposed in the Notice for ASCII coded communications in the VHF 4/ and higher frequency bands. Those comments also request a commensurate increase in the bandwidth authorized for unspecified digital codes. The comments of Paul Newland suggest that techniques such as "Time-Division Multiplex (TDM)" could be used so that "... more users could benefit by allowing digital transmissions to occupy a bandwidth greater than the Commission had initially planned to allocate." The Amateur Radio Research and Development Corporation (AMRAD) states in its comments that "(t)he highest permissible ASCII sending speed and bandwidth should be raised to 56 kilobits per second and 100 kHz respectively in the 220.5 to 221.9 MHz subband to

2/ See Section 1.106 and 1.115 of the Commission's Rules; also Section 5, paragraph (d)(4), and Section 405 of the Communications Act of 1934, as amended.

3/ Comments of the American Radio Relay League, Incorporated.

4/ The Very High Frequencies (VHF) are those between 30 and 300 MHz.

permit packet switching network operations in that subband." The reply comments of the ARRL state, "The League shares the concerns of Messrs. Rinaldo (for AMRAD) and Newland, and suggests that the Commission increase permissible bandwidths for digital transmissions at and above 220 MHz."

10. The Commission appreciates the desire of the amateur community to experiment and operate with state-of-the-art digital technology. Therefore, in order to avoid hampering these endeavors we are authorizing greater ASCII sending speeds and the use of wider bandwidths for unspecified coded transmissions. We are authorizing a sending speed as great as 56 kilobaud and a bandwidth as great as 100 kHz in accordance with the request of AMRAD; however, in order to permit the greatest flexibility in spectrum utilization, we are going to permit this speed and bandwidth on all frequencies above 220 MHz rather than limiting them to the frequencies between 220.5 and 221.9 MHz. Furthermore, the final rules will allow the use of any bandwidth on frequencies above 1215 MHz rather than imposing a limitation as was proposed in the Notice. The Commission is also not adopting the bandwidth restriction proposed for transmissions of ASCII coded communications on frequencies between 50 and 225 MHz, using sending speeds between 1200 and 19600 bits per second. Instead we will allow a maximum sending speed on the frequencies between 50 and 220 MHz of 19.6 kilobaud without a bandwidth restriction. The maximum speed of 56 kilobaud will apply to the frequencies between 220 and 225 MHz as discussed earlier. We are raising the permissible bandwidth for transmissions of unspecifically coded communications between 50 and 220 MHz from 16 kHz to 20 kHz in order to fit more closely our desire to equate these emissions with the ones currently used in those bands.

11. The Commission is also including some other minor changes in the final rules regarding sending speed and bandwidth. We are revising our bandwidth definition to eliminate certain ambiguities in the definition we proposed in the Notice. We wish to emphasize that this definition does not imply, nor do we intend to require, that amateur radio operators continuously monitor their emission bandwidth while using the digital codes which subject the station transmissions to bandwidth limitations. We only require that operators comply with the bandwidth requirements. Operators may determine compliance through electronic, mathematical or any other means they deem sufficient. We are also eliminating the requirement that stations using the Baudot code maintain the sending speed within certain tolerances. Currently, the sending speed must be maintained within 5 words per minute of the standard speeds (60, 67, 75 or 100 words per minute). However, that requirement no longer serves any regulatory purpose since electronic rather than electro-mechanical teleprinter equipment is now commonly used and the newer equipment is less sensitive to variations in sending speed.

12. As another minor change, the Commission is authorizing the use of A1 emissions for ASCII coded communications on all frequencies where F1 emissions are permitted. We had proposed to limit the use of A1 emissions for ASCII coding to the frequencies below 28 MHz, however we can find no reason not to permit this additional mode in the bands above 28 MHz as well. A small amendment to the rules regarding operator privileges is being added to preclude the use of ASCII coded communications by Novice class and Technician class operators using frequencies below 28.2 MHz. This represents no change in privileges for these operators.

13. Finally, with regard to the authorization of unspecified digital codes, concern was expressed in the Commission's Notice that such an authorization could affect "... our ability to monitor coded transmissions for content, as well as the ability of the amateur community to monitor transmissions from individual stations for the purpose of self-enforcement." In response to this concern the comments of the ARRL state the following:

> The League is sympathetic to, and generally shares the Commission's reservations about any reduction in the Commission's ability to monitor coded transmissions for content, or the amateur's ability to monitor for purposes of self-enforcement. A combination of several factors should be sufficient to minimize the potential for abuse, however. First, the primarily local nature of communications on the VHF and UHF frequencies involved should limit the potential ability of unscrupulous business users to utilize the amateur bands to transmit data of a commercial nature, circumventing existing common carriers. Second, the vigor with which amateurs protect their allocated frequency bands against unauthorized interlopers, together with well-polished direction finding techniques, will in most cases result in investigation by amateurs of the source of repeated unusual or suspicious digital transmissions. The requirement of open identification procedures is a significant litmus for distinguishing legitimate amateur use from unlawful misuse of amateur frequencies. Finally, the provisions of proposed Rules Section 97.69(c)(3) permit the Commission to take immediate action against a station suspected of unlawful misuse of the amateur bands via unspecified digital codes by ordering the cessation of the use of such codes. The above factors, together with the traditionally superlative level of rule compliance by amateurs, should be sufficient to offset the League's concern and that of the Commission with respect to potential misuse of digital codes.

We have considered this matter at great length. In balancing our objectives of encouraging new technologies against assuring our enforcement capability, it must be recognized that there is an incompatibility between authorizing experimentation with "exotic" technologies and the employment of channel monitoring as an enforcement tool. Our ability to verify that the content of messages complies with our rule requirements will be hindered by the broad relaxation of regulatory constraints that we are ordering in this proceeding. However, the Commission finds itself in agreement with the ARRL that special provisions we are including in the final rules, as well as existing provisions that identification be made in plain English or the international Morse code, should, when combined with the zealous effort of the amateur community to protect their allocated frequency bands, provide adequate protection against unauthorized operation in the service.

14. Accordingly, IT IS ORDERED that effective October 28, 1982, Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, IS AMENDED as set forth in the attached Appendix. IT IS FURTHER ORDERED that to the extent specified herein, RM-3788 IS GRANTED, and in all other respects it IS DENIED. IT IS FURTHER ORDERED that this proceeding IS TERMINATED. This

action is taken pursuant to authority contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended. In accordance with the Paperwork Reduction Act of 1980 (Public Law 96-511, December 11, 1980), the Commission will forward a copy of the final rules herein promulgated to the Associate Director for Information and Regulatory Affairs of the Office of Management and Budget. Further information on this matter may be obtained by contacting: Steve Lett, (202) 632-4964, Private Radio Bureau, Federal Communications Commission, Washington, DC 20554.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

APPENDIX

Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, is amended as follows:

1. In Section 97.7, paragraph (e) is revised to read as follows:

§ 97.7 Privileges of operator licenses.

* * * * *

(e) Novice Class. Radiotelegraphy in the frequency bands 3700-3750 kHz, 7100-7150 kHz (7050-7075 kHz when the terrestrial station location is not within Region 2), 21,100-21,200 kHz, and 28,100-28,200 kHz, using only type A1 emission and using only the international Morse code.

2. Section 97.69 is revised to read as follows:

§ 97.69 Digital communications.

Subject to the special conditions contained in paragraphs (a), (b) and (c) below, an amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements or other information. These digital codes may be used for such communications as (but not limited to) radio teleprinter, voice, facsimile, television, communications to control amateur radio stations, models and other objects, transference of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such digital codes are not intended to obscure the meaning of, but are only to facilitate, the communications, and further provided that such operation is carried out in accordance with other regulations set forth in this part. (For purposes of this section, the sending speed (signaling rate), in baud, is defined as the reciprocal of the shortest (signaling) time interval (in seconds) that occurs during a transmission, where each time interval is the period between changes of transmitter state (including changes in emission amplitude, frequency, phase, or combination of these, as authorized).)

(a) Use of the International Telegraphic Alphabet No. 2 (Baudot code) is subject to the following requirements:

(1) Transmission shall consist of a single channel, five unit (start-stop) teleprinter code conforming to the International Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in the "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The sending speed shall not exceed 100 words per minute (75 baud).

(3) When frequency (or phase) shift keying (type F1 emission) is utilized, the deviation from the mark signal to the space signal, or from the space signal to the mark signal, shall be less than 900 hertz.

(4) When audio frequency shift keying (type A2 or F2 emissions) is utilized, the highest fundamental modulating frequency shall not exceed 3000 hertz, and the difference between the modulating audio frequency for the mark signal and that for the space signal shall be less than 900 hertz.

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange as defined in American National Standards Institute (ANSI) Standard X3.4-1968.

(2) F1 emission shall be utilized on those frequencies between 3.5 and 29 MHz where its use is permitted; and the sending speed shall not exceed 300 baud.

(3) F1, F2 and A2 emissions may be utilized on those frequencies above 28 MHz where their use is permitted; and the sending speed shall not exceed the following:

(i) 1200 baud on frequencies between 28 and 50 MHz;

(ii) 19.6 kilobaud on frequencies between 50 and 220 MHz;

(iii) 56 kilobaud on frequencies above 220 MHz.

(4) A1 emission may be used for ASCII where F1 is permitted; and the sending speed shall not exceed that specified for other ASCII coded emissions on the same frequency.

(c) In addition to the above provisions, the use of any digital code is permitted on amateur frequencies above 50 MHz, except those on which only A1 emission is permitted, subject to the following requirements:

(1) Communications using such digital codes are authorized for domestic operation only (communications between points within areas where radio services are regulated by the U.S. Federal Communications Commission), except when special arrangements have been made between the United States and the administration of any other country concerned.

(2) The bandwidth of an emission from a station using such digital codes shall not exceed the following (where for this purpose the bandwidth is defined as the width of the frequency band, outside of which the mean power of any emission is attenuated by at least 26 decibels below the mean power of the total emission; a 3 kHz sampling bandwidth being used by the FCC in making this determination):

(i) 20 kHz on frequencies between 50 and 220 MHz;

(ii) 100 kHz on frequencies between 220 and 1215 MHz;

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Subject to the special conditions contained in paragraphs (a), (b) and (c) below, an amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements or other information. These digital codes may be used for such communications as (but not limited to) radio teleprinter, voice, facsimile, television, communications to control amateur radio stations, models and other objects, transference of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such digital codes are not intended to obscure the meaning of, but are only to facilitate, the communications, and further provided that such operation is carried out in accordance with other regulations set forth in this part. (For purposes of this section, the sending speed (signaling rate), in baud, is defined as the reciprocal of the shortest (signaling) time interval (in seconds) that occurs during a transmission, where each time interval is the period between changes of transmitter state (including changes in emission amplitude, frequency, phase, or combination of these, as authorized).)

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(2) The sending speed shall not exceed 100 words per minute (75 baud).

(3) When frequency (or phase) shift keying (type F1 emission) is utilized, the deviation from the mark signal to the space signal, or from the space signal to the mark signal, shall be less than 900 hertz.

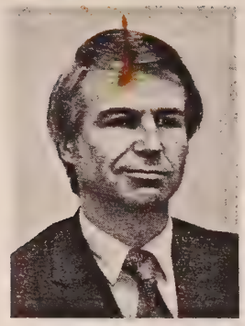
(3) A description of the digital code and the modulation technique shall be included in the station log during all periods of use and shall be provided to the Commission on request.

(4) When deemed necessary by an Engineer-in-Charge of a Commission field facility to assure compliance with the rules of this part, a station licensee shall:

(i) Cease the transmission of digital codes authorized under this paragraph.

(ii) Restrict the transmission of digital codes authorized under this paragraph to the extent instructed.

(iii) Maintain a record, convertible to the original information (voice, text, image, etc.), of all coded communications transmitted under authority of this paragraph.



News from Washington

Eric Schimmel
Washington News Editor

Digital Communications

In keeping with our recent practice of publishing information on FCC activity in the area of spectrum technology, we are reprinting some excerpts from a recent report entitled "The Future of Digital Technology in the Private Radio Services. If you wish additional information on the report, which is some 60 pages in length, contact the Policy Development Division, Private Radio Bureau, Federal Communications Commission, Room 5322, 2025 M Street, N.W., Washington, D.C. 20554, (202) 254-3301.

This report presents the results of a staff study conducted by the Policy Development Division of the Private Radio Bureau (PRB). The study was conducted to provide information and analysis on issues and concepts of significance to the Bureau. This report is intended to stimulate discussion within and outside the FCC. The analyses and conclusions presented in the report are those of the Private Radio Bureau staff and do not necessarily reflect the views of the other Commission staff or the Commission itself. Discussions of rulemakings which have not been adopted by the Commission represent PRB staff opinions and do not necessarily reflect the view of other Commission staff or the Commission itself.

EXECUTIVE SUMMARY

The following report provides an overview of developments in digital technology, an assessment of the effect of the current regulatory structure in the various private radio services on the adoption of digital technologies, and an exposition of several regulatory areas which may require attention in the near future.

Chapter 1 is a discussion of the current state of digital communication in each of the five major private radio service categories:

Aviation, Land Mobile, Marine, Microwave, and Personal. Federal Communications Commission rules have been changed in the past in response to petitions requesting that specific types of digital systems be authorized in the various services. However, the rules are not always sufficiently flexible to allow the use of new digital technologies or expanded use of current technologies. Several current rulemaking initiatives will provide additional flexibility to accommodate near-term requirements.

Chapter 2 is a discussion of the digital technological developments expected over the next twenty years, along with some resulting regulatory issues. It is expected that digital transmission will predominate throughout the private services early in the next century, if not before. The digital "explosion" is not likely to occur in the near-term. Instead, a period of moderate growth and development probably will be experienced.

Chapter 3 contains a discussion of the factors which are likely to be most inportant in influencing the rate of adoption of digital technologies in the various private radio services. The most important factors influencing the rates of adoption of digital technology in the near term are:

1. Need for data communications (person to computer and computer to computer);
2. Need for secure communications (digitized voice or specially coded data);
3. Regulatory constraints (including international agreements);
4. Market structure (new entering market with lower cost digital communication products);
5. Need for improved system performance (shorter wait times, improved efficiency and convenience of operation);
6. The rate of development of competing common carrier (and other) systems and analog technologies.

In Chapter 4, recommendations are made about what actions, if any, should be taken in the near future to facilitate the adoption of digital technology in the private radio services. These recommendations are summarized below:

A. General - Review all permissible communications and eligibility rules in the private radio services to determine applicability and enforceability in a digital radio environment.

B. Aviation-No immediate action appears necessary.

C. Land Mobile

1. Review policy establishing voice as predominant operating mode.
2. Study the compatibility

of analog and digital transmissions to determine if digital-only channels should be allocated; if so, consider whether to allocate these channles from the 900 MHz reserve or from some other band.

3. Review station identification requirements and the Commission's ability to monitor transmissions for enforcement purposes in a digital environment.

4. Review subpart J, including 90.233(b) which is the "two-second" rule, in light of increased demand for non-voice operations and the difficulty in distinguishing between digitized voice and data.

D. Marine - No immediate actions appears necessary other than continuing work to expand use of narrow-band-direct-printing.

E. Microwave - Develop criteria for channel assignment which reflect the bandwidth requirements for systems using both voice and data.

F. Personal

1. Continue work on Docket 20777 (deregulation of Part 97 regarding emissions authorized in the Amateur Radio Service), RM-3788 (use of additional digital modes in the Amateur Radio Service) and the NPRM for a new 900 MHz personal service.

2. Review radio control rules to determine feasibility of relaxing restrictions on permissible emissions.

3. Review CB and GMRS rules to determine feasibility of relaxing restrictions on permissible emissions.

Summary

The preceding discussion has indicated that digital transmission will become the standard in the PSTN as well as in other ICNs in the not-too-distant future. It also is clear that the computer market, and especially the personal computer market, will be expanding rapidly during the next decade. The expanded use of computers and ICNs in turn is creating a new information industry to provide data bank and electronic mail service. The above developments will be providing a very strong impetus for the eventual conversion of the private services to digital, by stimulating digital hardware cost reductions, and by stimulating interest in accessing computers and interconnecting with larger communication systems.

Summary

It appears there will be tremendous improvements in digital voice encoding technology during the next decade, with a variety of low-cost, highly efficient systems being developed that can provide good quality (voice) communications. However, this development will force the Commission to address a number of regulatory questions concerning permissible communications and service distinctions. The rate of adoption of the new technology will depend not only on the resolution of the above issues, but also on the regulatory incentives that are provided, and a host of market related conditions. In conclusion, it seems that increased use of digital voice systems is fairly inevitable in most of the private services, although there is uncertainty about its rate of adoption.

Summary. Status reporting systems can only transmit a relatively limited number of messages, but can be more spectrally efficient than two-way data systems and cost less. The operating characteristics of status reporting systems complement those of a two-way data system and can help offset some of the dissadvantages of non-voice systems. In the future, we can expect to see further development of more sophisticated status reporting systems, such as the Gandalf system, with perhaps some significant cost reductions.

Summary. Digital paging will offer improvements not only in spectrum efficiency, but also in receiver operating convenience and flexibility. Although a price premium initially will be associated with the new digital pagers, it should disappear as the market develops and becomes more competitive. However, the enforcemet problems still may be significant enough to encourage a reevaluation of the role of service distinctions and permissible communications in the future digital communications environment.

Summary

Non-voice digital systems can offer a substantial improvement in spectrum efficiency and several operational advantages for some types of services. Future systems can be expected to be more spectrally efficient and less expensive, especially if the market expands. Modest increased use of these systems is expected in most services during the next five years, with usage expanding at a greater rate after that period. In order to not impede this development, the Commission will have to resolve the same regulatory issues associated with digital voice communications (i.e., permissible communications and service distinctions) as well as some additional issues (e.g., wideband channels and

additional exclusive channels for non-voice digital communications).

Conclusion

General

Digital transmission (voice and data) will predominate throught the private services early in the next century, if not before. The transformation from analog to digital will result from the rapid development of personal computers and large digital integrated communication networks; the need to use the spectrum efficiently in order to accommodate more users; and the desire for enhanced flexibility of operation that can be provided by digital technology.

The digital "explosion" is not likely to occur in the near-term (next five years), since personal computers are just beginning to make significant penetration into U.S. households and businesses, and digital ICNs are beginning a period of rapid development. It will be at least five years before a significant number of private service licensees become comfortable with computers, and subsequently non-voice communication systems.

Increased use of digital technology will force the Commission to consider a number of issues relating to permissible communications, service distinctions, regulatory structure, and technical standards (interference considerations). The Commission may have to modify its approach to regulating the private services in order to not impede adoption of the more efficient digital technologies.

Digital Voice

Digitized voice systems may eventually outperform analog systems at a comparable price, however, this will require a significant breakthrough in voice encoding technology. Analog techniques for voice communication will dominate for at least the next 10-15 years.

There will be modest growth in land mobile digital voice systems in the near-term as the importance of secure communications continues to grow.

Increased use of digital voice also can be expected in the mocrowave and aviation services, but will be adopted more slowly in the personal and marine services.

Non-Voice Systems

Two-way data, status reporting, and digital paging systems offer a comparatively high level of spectral efficiency which could be further improved.

The cost of non-voice systems is relatively high, but should decrease significantly in the future.

Two-way data and status reporting systems can substitute for voice systems in some types of operations.

Digital paging can provide improvements in spectrum efficiency and receiver-operating convenience, but at higher cost in the near-term.

Digital (alphanumeric readout) pagers may substitute for voice pagers, but this probably will not occur to a great extent in the private services.

Non-voice communications will increase in all private services at a modest rate during the next five years.

Advanced Systems

Advanced systems (packet radio, spread spectrum, integrated radio systems) can facilitate development of digital communications and can offer enhanced flexibility for the system designer and user.

Advanced systems will be used to a limited extent in the private services in the near-term.

The Commission will have to resolve a number of significant issues before advanced systems can be widely employed in the private services.

Chapter 3 - FACTORS INFLUENCING THE ADOPTION OF DIGITAL TECHNOLOGIES

The factors which are likely to affect the rate of adoption of digital technologies can be grouped into three major categories: (1) factors related to the availability of spectrum in general and for specific technologies; (2) factors related to specific communication needs and applications; and (3) economic factors.

The first category includes such factors as: the amount of available spectrum; the availability of substitute communication services which do not utilize "private" spectrum' the overall demand for communication services which fall under the purview of PRB; the regulatory environment vis-a-vis digital emissions; and international obligations. The second category includes such factors as: the demand for secure communications other than that using analog scrambling; the demand for data communications in a mobile environment; the demand for high bit rate data communication; the demand for more reliable mobile communication in congested urban areas; as well as the demand for other communication applications which cannot be accomplished

using analog transmissions. The third category includes such factors as: the cost of digital equipment (which will probably be affected to some extent by the rate of adoption of digital technologies in the telephone system); the costs of comparable analog equipment; and the cost of obtaining needed communication services.

In the following sections, the factors which are likely to be most important in influencing the adoption of digital technology in each of the private radio services, within the next five years, will be discussed. An attempt will be made, where possible, to rank the factors by relative importance within a service category. In addition, any important interrelationships of the factors will be examined and discussed.

Land Mobile

In the land mobile radio services, it would appear that the primary factor which will influence the rate of adoption of digital technologies is the demand for data transmission capabilities in a mobile environment. The reason for this is that this is a communications capability which requires digital transmissions. While the need for secure communications can be met with either analog or digital, this is not the case with data. Furthermore, it is possible that cellular mobile telephone systems may provide a secure voice communication service for many land mobile users. Therefore, although the demand for secure communications will have some influence on the rate of adoption of digital technologies in the land mobile services, the availability of substitutes in the form of analog scrambling and/or common carrier services such as cellular, make this factor less important than the demand for data transmission capability.

The cost of specialized digital equipment will also affect the rate of adoption of digital technology in the land mobile services. However, it is expected that the cost will decline from current levels as the demand increases and additional equipment manufacturers are attracted into the marker for digital equipment. Less expensive equipment may also result from digital developments in the telephone network, as well as other digital transmission systems which may have applicability in the land mobile radio services.

Finally, spectrum availability will have an impact on the rate of adoption of digital technology in land mobile. The specific effects of the amount of spectrum which is available are somewhat ambiguous. On one level, an increased supply of available spectrum may slow adoption of digital which is being used to make more intensive use of a given amount of spectrum. Therefore, in terms of adopting digital to increase efficient spectrum use, an increased supply of spectrum could serve to slow the rate of adoption of digital. However, for those uses which require digital emissions (data transmission and digitized voice) an increased supply of spectrum should help to accelerate the adoption of digital technology in land mobile because of the opportunity to establish digital systems in new spectrum without the problem of possible interference complaints from established analog users. While there are conflicting opinions about the ability of analog and digital to coexist on common frequencies, it is clear that the likelihood of implementation of digital in land mobile would be incresed if new spectrum from the 45 MHz of reserve spectrum from the 900 MHz band were allocated for digital use on a primary basis, or for digital or analog on an equal basis. In this case, an increae in the availability of spectrum should result in an increase in the rate of adoption of digital technologies in the land mobile services.

CHAPTER 4 - TIME FRAME FOR REGULATORY ACTION

Traditionally, as new service needs and/or technologies develop, the Commission receives a petition for rulemaking to modify existing rules to permit the new service and/or technology. This approach is viable in cases in which sufficient lead time exists between the time the petition is submitted to the Commission, and the time the petitioner desires to use the new service and/or foresight on the part of the petitioner, as well as a reasonably expeditious rulemaking process by the Commission. The increasing rate of technological change in communications is making it more difficult for the Commission to changes rules, in a timely manner, in response to petitions. Consequently, unless the Commission anticipates new technologies to some extent, we will be likely to impede some of the new technologies.

It is clearly impossible to accurately predict which new technologies will be used in various service areas, or exactly when they will be used. Therefore, in order to provide for these technologies, the Commission must develop more flexible rules. However, this flexibility must be constructed in such a way that existing systems are not jeopardized. Essentially, the Commission must balance a desire to maintain the quality of existing services with a desire to build additional flexibility into the regulatory structure in order to more easily authorize new technolgies. The inevitable movement of the private radio services toward greater use of digital technologies necessitates a change in the current regulatory structure.

Given this general framework, each private radio service area is discussed to indicate what actions, if any, are needed to facilitate the use of digital technologies within the next few years.

General

An area which affects all services is a review of permissible communications and eligibility rules for applicability and enforceability in a digital radio environment. As the use of digital emissions becomes more prevalent, a continuation of existing permissible communications and eligibility rules will require either more sophisticated monitoring equipment or a relaxation of some of these rules, or some combination. This could be a problem both for services within a major service area, as well as among the major service areas.

Land Mobile

The existing regulatory structure for the private land mobile services assumes voice as the predominant mode of operation. Digital transmissions, when permitted, are authorized on a secondary basis to voice. The reasoning behind the secondary basis, as well as the "two-second" rule regarding digital transmissions, is to assure that in case of conflict, voice will prevail. This may be an appropriate time for the Bureau to reevaluate its existing policy about the nature of private land mobile communication, and initiate an inquiry into authorizing digital on an equal basis with voice. Unless this basic policy is changed it is likely that the adoption of digital technologies in the private land mobile service will be impeded. However, prior to changing this policy, it is necessary to determine what, if any, technical problems may arise in an environment shared by both analog and digital transmissions. The Bureau should also investigate the desirability of allocating channels for digital use only, or digital use on a primary basis. Special digital channels may be advisable because some digital systems may require bandwidth which is wider than a standard voice channel in order to operate efficiently. Such channels also could serve to speed the adoption of digital in the land mobile service. Since the spectrum which is most likely to be readily available for such channels in the near-term is in the 900 MHz reserve, and since this reserve is being gradually allocated, it would seem incumbent upon PRB to ascertain as expeditiously as possible whether or not there is a need for an allocation from this reserve for digital technologies.

Another aspect of the private land mobile radio services which will be affected by the increased use of digital technology is the whole area of permissible comunications rules and existing service distinctions. Since much of the private land mobile regulatory structure contains various eligibility requirements and rules regarding what type(s) of communication can be conducted on certain frequencies, and given the fact that digital transmissions are inherently more difficult to monitor for purposes of enforcing permissible communication and/or eligibility rules, PRB will have to reexamine some of these rules. There are two related issues to be addressed here. First, if monitoring digital transmissions are not restricted, since much of the regulatory structure becomes, de facto, unenforceable, should the regulatory structure be modified to reflect this situation? Related to this second point is the question of station identification requirements. Current rules require identification either in voice or international Morse code. If it is decided to deviate from the current regulatory structure which favors voice over digital, it will be necessary to consider modifying identification requirements as well. Any modification would, of course, have to be done in conjuction with FOB.

Finally, although several pending rulemakings serve to relax some of the restrictions on digital emissions identified in Chapter 1, there still appear to be restrictions on the use of digital in the 800 MHz band. Specifically, licensees are precluded from using digitized voice, except in the Police, Fire, and Power Radio Services, by 90.385(c). While a proposal is being developed to authorize digitized voice to other land mobile licensees, the authorization would be on a secondary basis to voice. In terms of digital data, although a proposal is being developed to relax the restrictions contained in 90.385(c), licensees on shared frequencies would still be restricted by the "two second" rule on transmissions. Since digital data transmissions are more efficient in terms of spectrum use, it would seem that the current "two-second" limitation should be reexamined to determine if it is deterring the adoption of digital systems. Also, since it may be impossible to easily distinguish between digitized voice and digital data, the two-second limitation on non-voice transmissions may be unenforceable.

Related to this point is our entire approach to non-voice operations. The Bureau currently has very detailed rules limiting the use of land mobile frequencies for various signaling, telemetry or alarm operations. With the likely increase in the demand for such remote operating capabilities, as labor and transportation costs increase and communication costs remain stable and/or decrease, a reevaluation for the restrictions contained in Subpart J would seem to be appropriate.

Briefly, the following four items for further action in the land mobile area are recommended:

1. Review policy establishing voice as predominant operating mode.

2. Study the compatibility of analog and digital transmissions to determine if digital-only channels should be allocated; if so, consider whether to allocate these channels from the 900 MHz reserve, or from some other band.

3. Review station identification requirements.

4. Review Subpart J, including 90.233(b) which is the "two-second" rule, in light of increased demand for non-voice operations and the impossibility of distinquising between digitized voice and data.

Conclusions

The use of digital technologies for voice and data transmission has been growing at a modest rate within the private radio services in recent years. However, as the demand for secure communications increases, as the demand for high speed data transmission capability increases, as personal computers and large digital integrated communication networks develop, and as expected that the transformation from analog to digital will accelerate. All of the private radio services are likely to witness a gradual increase in the use of digital technologies over the next five years, with even more rapid changes expected beyond a five year time frame.

Since the rate of technological innovation in communications is increasing, it is imperative that the Commission take the necessary actions to insure that the adoption of new technologies is neither hindered nor blocked by an inflexible regulatory structure. Existing rules must be continually monitored to identify areas in which new technology may be stifled. Proposed rules must be written in such a way that licensees are afforded as much technical flexibility as is possible, consistent with acceptable interference levels. In such a regulatory environment, digital technologies will flourish not because of regulatory fiat, but rather because of existing and projected communications needs.

Before the
Federal Communications Commission
Washington, D. C. 20554

FCC 81-459
29968

In the Matter of	)	
	)	PR Docket No. 81-699
Use of Additional Digital Codes	)	RM-3788
in the Amateur Radio Service.	)	

NOTICE OF PROPOSED RULEMAKING

Adopted: October 1, 1981 Released: October 9, 1981

By the Commission:

1. Notice of Proposed Rulemaking in the above-captioned matter is hereby given.

2. The Commission has before it a petition for rulemaking, RM-3788, submitted by the American Radio Relay League (ARRL) and received by the Commission on October 21, 1980. The petition seeks amendment of the Amateur Radio Service Rules (Part 97) to provide for the use of any digital encoding technique in the amateur radio frequency bands above 50 MHz. Currently the Rules only permit the use of the International Telegraphic Alphabet Number 2 (Baudot code) and the American Standard Code for Information Interchange (ASCII code). Finding merit in the petition, the Commission is proposing rules permitting other digital encoding techniques.

Background

3. In April 1976, the Commission opened Docket 20777 to address the issue of expanding the emission types to be authorized in the Amateur Radio Service. At that time, Baudot was the only digital type emission permitted for use by amateur radio stations. After considering the comments in the matter, the Commission, in its Third Report and Order, 1/ decided to limit its action to permitting only one additional digital code, the ASCII code. However, at the same time the Commission pointed out that "amateur operators expressed interest in using radioteleprinter codes other than Baudot or ASCII" 2/ and that it was "not necessarily opposed to such extensive deregulation." With the closing of Docket 20777, the issue of other digital codes is the subject of this proceeding.

1/ 45 FR 8990.

2/ Frequently cited examples were the Binary Coded Decimal (BCD), Extended Binary Coded Decimal Interchange Code (EBCDIC), Moore and Correspondence (IBM Selectric) codes, various computer or "machine" languages, and "packet switching" techniques.

4. The primary reservation the Commission stated in the Third Report and Order in Docket 20777 to providing for other additional digital code types was concern over whether "such an action would be consistent with Article 41 of the International Telecommunication Union (ITU) Regulations." Section 2(1) of that article states, in part, that "transmissions between amateur stations of different countries ... shall be made in plain language." Citing this concern, the ARRL petition seeks a rule amendment specifically "to allow use of new, additional digital techniques in the VHF and UHF amateur bands, for domestic communications" only. Use of the frequencies above 50 MHz is proposed as a means of naturally limiting international propagation of non-standard emissions.

5. We have also been concerned over possible impact upon our ability to monitor transmissions of non-standard digital codes for the purpose of enforcing our rules and regulations. The ARRL petition contends that "the largely local characteristics of (the) expected digital transmissions under (the) proposed rules on the VHF and UHF bands, and the continued open identification procedures" should help satisfy Commission monitoring requirements. They also point to the permitted use of foreign languages by amateur radio operators despite the Commission's inability to monitor them for content and the generally high degree of operator compliance with the rules relating to permissible communications. While our concern is mitigated by the petition's proposal, we still have some reservations about thwarting our ability to monitor coded transmissions for content, as well as the ability of the amateur community to monitor transmissions from individual stations for the purpose of self-enforcement. 3/

6. The ARRL petition also recommends two other changes in the Commission's Rules regarding digital transmissions. It requests that A1 (on-off keying) ASCII emissions be permitted where F1 (frequency shift keying) emissions are permitted below 28 MHz, and that maximum ASCII speeds on amateur frequencies between 50 MHz and 225 MHz be raised from 1200 baud to 4800 baud.

The Proposal

7. The Commission proposes to permit the transmission of digital codes other than those now specifically designated in the rules. This would be permitted domestically on Amateur Radio Service frequencies above 50 MHz with the exception of those frequencies designated for A1 telegraphy emissions only (50.0-50.1, 144.0-144.1 MHz). The Rules currently permit the transmission of digital codes "for such purposes as (but not restricted to) radio teleprinter communications, control of amateur radio stations, models and other objects, transfer of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called 'packet switching' systems)." We believe that other unspecified digital coding techniques may also lend themselves to digital voice,

3/ Related questions addressing the Commission's monitoring responsibilities are presented in a Notice of Inquiry and Proposed Rulemaking adopted by the Commission on June 30, 1981 in a proceeding dealing with authorization of spread spectrum modulation in the Amateur Radio Service, General Docket 81-414.

facsimile and television communications. As such uses are not currently prohibited by the rules, the Commission does not see a need to restrict these uses for the unspecified digital codes. 4/ However, the emission bandwidth of such transmissions, we believe, should be approximately limited to that of an ASCII type coded transmission in the same band. This should avoid causing any more interference to existing operations than would result from the transmission of the digital codes already authorized.

8. In order to provide for enforcement and monitoring functions, we propose that certain requirements be placed on stations transmitting these unspecified digital codes. We would require the station licensee to include a description of the unspecified coding techniques in their station records and for them to supply this information to the Commission on request. We also propose to grant the Engineers-in-Charge (EICs) of the various Commission field offices authority to restrict or bar the transmission of unspecified codes by specific amateur radio stations. The EIC would also be authorized to require station licensees to maintain a record, convertible to plain language, of all unspecified code transmissions from his/her station and the stations being communicated with. Station identification requirements would remain unchanged from those currently applicable to digital (radio teleprinter) transmissions. Identification would be made by telegraphy using the international Morse code, or by telephony (A3 or F3) using the English language.

9. The Commission further proposes to permit the use of A1 emissions for the transmission of ASCII coded communications on those Amateur Radio Service frequencies below 28 MHz where F1 emissions are permitted. This should provide greater operating flexibility with no adverse impact on existing operations.

10. The ARRL petition's request that maximum ASCII sending speeds on Amateur Radio Service frequencies between 50 MHz and 225 MHz be raised to 4800 baud is supported by its contention that "(u)nder some techniques, it should be possible for amateurs to transmit ASCII at 4800 baud, with a shift of 5440 Hertz, and produce a bandwidth well within the accepted norm (on VHF frequencies) of 16 kHz."5/ While the Commission agrees with the petition that this would encourage experimentation, we must be cautious to avoid allowing excessive interference to existing operations. Consequently, we propose to only limit sending speeds in those bands to approximately 19.6 kilobaud,

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4/ The 1979 World Administrative Radio Conference specified new emission designators in order to more accurately account for sophisticated modulation techniques. These changes are pending treaty ratification and are currently a subject in the proceeding dealing with implementation of the Final Acts of the World Administrative Radio Conference, General Docket No. 80-739. Accordingly, no emission designators are specified in the text for operation using non-standard digital codes in conjunction with the various authorized modulation modes. Furthermore, it should be noted that the designators for conventional modes of operation are likely to change in the future.

5/ Emphasis added.

provided that such use shall produce a bandwidth no greater than 16 kHz. 6/ A maximum speed limitation equivalent to the highest speed permitted in any other bands is proposed in addition to the bandwidth limitation in order to help ensure our monitoring capabilities. Sixteen kilohertz would also be the maximum bandwidth of unspecified digital transmissions in the frequency bands between 50 MHz and 225 MHz by inference from paragraph 7 of this proposal.

11. Finally, the Commission proposes to replace the term "baud" in the rule section dealing with digital transmissions with the term "bits per second" or "bps." This is proposed in the interest of eliminating a somewhat ambiguous quantitative description currently used in the Rules. The "bits per second" description more accurately fulfills the Commission's intentions behind the rate limitation rules and aids in clarifying the regulatory requirements. This substitution should not have any adverse affect upon amateur operations.

Conclusion

12. NOTICE IS HEREBY GIVEN that it is proposed to amend 47 CFR Part 97 in accordance with the proposal set forth in the attached Appendix.

Procedural Matters

13. For purposes of this non-restricted notice and comment rule-making proceeding, members of the public are advised that ex parte contacts are permitted from the time the Commission adopts a notice of proposed rule making until the time a public notice is issued stating that a substantive disposition of the matter is to be considered at a forthcoming meeting or until a final order disposing of the matter is adopted by the Commission, whichever is earlier. In general, an ex parte presentation is any written or oral communication (other than formal written comments/pleadings and formal oral arguments) between a person outside the Commission and a Commissioner or a member of the Commission's staff which addresses the merits of the proceeding. Any person who submits a written ex parte presentation must serve a copy of that presentation on the Commission's Secretary for inclusion in the public file. Any person who makes an oral ex parte presentation addressing matters not fully covered in any previously-filed written comments for the proceeding must prepare a written summary of that presentation; on the day of oral presentation, that written summary must be served on the Commission's Secretary for inclusion in the public file, with a copy to the Commission official receiving the oral presentation. Each ex parte presentation described above must state on its face that the Secretary has been served, and must also state by docket number the proceeding to which it relates. See generally, Section 1.1231 of the Commission's rules, 47 C.F.R. Section 1.1231.

6/ This bandwidth would be defined as those frequencies, outside of which each sideband emission has a power level which is 26 decibels below the power level of the total emission. This definition is consistent with that which was proposed in the proceeding dealing with revision of the Amateur Radio Service Rules into "plain language," PR Docket 80-729. It should be noted that this definition is not that given in the international Radio Regulations for either occupied bandwidth or necessary bandwith and only applies to this proposal.

A summary of the Commission's procedures governing ex parte contacts in informal rulemakings is available from the Commission's Consumer Assistance Office, FCC Washington, DC 20554, (202) 632-7000.

14. Authority for issuance of this Notice is contained in Sections 4(i) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i) and 303(r). Pursuant to applicable procedures set forth in Section 1.415 of the Commission's Rules, interested persons may file comments on or before January 15, 1982, and reply comments on or before February 15, 1982. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may take into consideration information and ideas not contained in the comments, provided that such information or a writing indicating the nature and source of such information is placed in the public file, and provided that the fact of the Commission's reliance on such information is noted in the Report and Order.

15. In accordance with Section 1.419 of the Commission's Rules, 47 C.F.R. 1.419, formal participante must file an original and five copies of their comments and other materials. Participants who wish each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of copies submitted. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, DC.

16. The Commission has determined that Sections 603 and 604 of the Regulatory Flexibility Act of 1980 (Public Law 96-354) do not apply to this rulemaking proceeding since this action is deregulatory in nature and since we would anticipate only a slight, insignificant impact on small businesses. This impact would be beneficial and would result from some amateur radio operators purchasing computer, radio, and related electronic equipment for experimentation authorized under this proposal. There would be no impact on small organizations or small governmental jurisdictions since the proposed rules in no way pertain to any such groups.

17. IT IS ORDERED that the Secretary shall cause a copy of this Notice to be served upon the Chief Counsel for Advocacy of the Small Business Administration and that the Secretary shall also cause a copy of this Notice to be published in the Federal Register.

18. For further information on this proceeding contact Steve Lett, Federal Communications Commission, Private Radio Bureau, Washington, DC 20554, (202) 632-7597.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

Attachment

A P P E N D I X

It is proposed that Section 97.69 of the Commission's Rules and Regulations, 47 CFR 97.69, be revised to read as follows:

§97.69 Digital transmissions.

Subject to the special conditions contained in paragraphs (a), (b) and (c) below, the use of the International Telegraphic Alphabet No. 2 (also known as the Baudot Code), the American Standard Code for Information Interchange (ASCII) and other digital codes may be used for such purposes as (but not restricted to) radio teleprinter communications, control of amateur radio stations, models and other objects, transfer of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such operation is carried out in accordance with the other regulations set forth in this Part.

(a) Use of the International Telegraphic Alphabet No. 2 (Baudot Code) is subject to the following requirements:

(1) Transmission shall consist of a single channel, five-unit (start-stop) teleprinter code conforming to the International Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The transmitting speed shall be maintained within five words per minute of one of the following standard speeds: 60, 67, 75 or 100 words per minute (45, 50, 56 or 75 bits per second, respectively).

(3) When frequency shift keying (type F1 emission) is utilized, the deviation in frequency from the mark signal to the space signal, or from the space signal to the mark signal, shall be less than 900 hertz.

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange as defined in American National Standards Institute (ANSI) Standard X3.4-1968.

(2) F1 emission shall be utilized on those frequencies between 3.5 and 28 MHz where its use is permissible; and the sending speed shall not exceed 300 bps (bits per second). A1 emission may also be used for ASCII where F1 is permitted; and the sending speed shall not exceed 300 bps.

(3) F1, F2 and A2 emissions may be utilized on those frequencies between 28 and 225 MHz where their use is permissible; and the sending speed shall not exceed 1200 bps.

(4) Sending speeds as great as 19.6 kbps (kilobits per second) may be utilized on those frequencies between 50 and 225 MHz provided that the bandwidth of such emissions does not exceed 16 kHz. (The bandwidth is defined as those frequencies, outside of which each sideband emission has a power level which is at least 26 decibels below the power level of the total emission.)

(5) F1, F2 and A2 emissions may be utilized on those frequencies above 225 MHz where their use is permissible; and the sending speed shall not exceed 19.6 kbps.

(c) Domestic use (communications between points within areas regulated by the FCC) of digital codes in addition to international Morse, Baudot or ASCII is permitted on all amateur frequencies above 50 MHz except those on which only A1 emission is permitted, subject to the following requirements:

(1) The bandwidth of an emission from a station using such digital codes shall not exceed 16 kHz on amateur frequencies between 50 and 225 MHz, and shall not exceed 40 kHz on amateur frequencies above 225 MHz. (The bandwidth is defined as those frequencies, outside of which each sideband emission has a power level which is at least 26 decibels below the power level of the total emission.)

(2) A description of the digital code shall be entered into the station log and provided to the Commission on request.

(3) Upon direction of the Commission or any Engineer-in-Charge of a Commission field facility, a station licensee shall:

(i) Cease the transmission of codes authorized under this paragraph.

(ii) Restrict the transmission of codes authorized under this paragraph to the extent instructed.

(iii) Maintain a record, convertible to plain language, of all coded transmissions authorized under this paragraph and the transmissions of the stations being communicated with.

Before the
Federal Communications Commission
Washington, D. C. 20554

FCC 81-459
29968

In the Matter of	)	
	)	PR Docket No. 81-699
Use of Additional Digital Codes	)	RM-3788
in the Amateur Radio Service.	)	

NOTICE OF PROPOSED RULEMAKING

Adopted: October 1, 1981 Released: October 9, 1981

By the Commission:

1. Notice of Proposed Rulemaking in the above-captioned matter is hereby given.

2. The Commission has before it a petition for rulemaking, RM-3788, submitted by the American Radio Relay League (ARRL) and received by the Commission on October 21, 1980. The petition seeks amendment of the Amateur Radio Service Rules (Part 97) to provide for the use of any digital encoding technique in the amateur radio frequency bands above 50 MHz. Currently the Rules only permit the use of the International Telegraphic Alphabet Number 2 (Baudot code) and the American Standard Code for Information Interchange (ASCII code). Finding merit in the petition, the Commission is proposing rules permitting other digital encoding techniques.

Background

3. In April 1976, the Commission opened Docket 20777 to address the issue of expanding the emission types to be authorized in the Amateur Radio Service. At that time, Baudot was the only digital type emission permitted for use by amateur radio stations. After considering the comments in the matter, the Commission, in its Third Report and Order, 1/ decided to limit its action to permitting only one additional digital code, the ASCII code. However, at the same time the Commission pointed out that "amateur operators expressed interest in using radioteleprinter codes other than Baudot or ASCII" 2/ and that it was "not necessarily opposed to such extensive deregulation." With the closing of Docket 20777, the issue of other digital codes is the subject of this proceeding.

1/ 45 FR 8990.

2/ Frequently cited examples were the Binary Coded Decimal (BCD), Extended Binary Coded Decimal Interchange Code (EBCDIC), Moore and Correspondence (IBM Selectric) codes, various computer or "machine" languages, and "packet switching" techniques.

4. The primary reservation the Commission stated in the Third Report and Order in Docket 20777 to providing for other additional digital code types was concern over whether "such an action would be consistent with Article 41 of the International Telecommunication Union (ITU) Regulations." Section 2(1) of that article states, in part, that "transmissions between amateur stations of different countries ... shall be made in plain language." Citing this concern, the ARRL petition seeks a rule amendment specifically "to allow use of new, additional digital techniques in the VHF and UHF amateur bands, for domestic communications" only. Use of the frequencies above 50 MHz is proposed as a means of naturally limiting international propagation of non-standard emissions.

5. We have also been concerned over possible impact upon our ability to monitor transmissions of non-standard digital codes for the purpose of enforcing our rules and regulations. The ARRL petition contends that "the largely local characteristics of (the) expected digital transmissions under (the) proposed rules on the VHF and UHF bands, and the continued open identification procedures" should help satisfy Commission monitoring requirements. They also point to the permitted use of foreign languages by amateur radio operators despite the Commission's inability to monitor them for content and the generally high degree of operator compliance with the rules relating to permissible communications. While our concern is mitigated by the petition's proposal, we still have some reservations about thwarting our ability to monitor coded transmissions for content, as well as the ability of the amateur community to monitor transmissions from individual stations for the purpose of self-enforcement. 3/

6. The ARRL petition also recommends two other changes in the Commission's Rules regarding digital transmissions. It requests that A1 (on-off keying) ASCII emissions be permitted where F1 (frequency shift keying) emissions are permitted below 28 MHz, and that maximum ASCII speeds on amateur frequencies between 50 MHz and 225 MHz be raised from 1200 baud to 4800 baud.

The Proposal

7. The Commission proposes to permit the transmission of digital codes other than those now specifically designated in the rules. This would be permitted domestically on Amateur Radio Service frequencies above 50 MHz with the exception of those frequencies designated for A1 telegraphy emissions only (50.0-50.1, 144.0-144.1 MHz). The Rules currently permit the transmission of digital codes "for such purposes as (but not restricted to) radio teleprinter communications, control of amateur radio stations, models and other objects, transfer of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called 'packet switching' systems)." We believe that other unspecified digital coding techniques may also lend themselves to digital voice,

3/ Related questions addressing the Commission's monitoring responsibilities are presented in a Notice of Inquiry and Proposed Rulemaking adopted by the Commission on June 30, 1981 in a proceeding dealing with authorization of spread spectrum modulation in the Amateur Radio Service, General Docket 81-414.

facsimile and television communications. As such uses are not currently prohibited by the rules, the Commission does not see a need to restrict these uses for the unspecified digital codes. 4/ However, the emission bandwidth of such transmissions, we believe, should be approximately limited to that of an ASCII type coded transmission in the same band. This should avoid causing any more interference to existing operations than would result from the transmission of the digital codes already authorized.

8. In order to provide for enforcement and monitoring functions, we propose that certain requirements be placed on stations transmitting these unspecified digital codes. We would require the station licensee to include a description of the unspecified coding techniques in their station records and for them to supply this information to the Commission on request. We also propose to grant the Engineers-in-Charge (EICs) of the various Commission field offices authority to restrict or bar the transmission of unspecified codes by specific amateur radio stations. The EIC would also be authorized to require station licensees to maintain a record, convertible to plain language, of all unspecified code transmissions from his/her station and the stations being communicated with. Station identification requirements would remain unchanged from those currently applicable to digital (radio teleprinter) transmissions. Identification would be made by telegraphy using the international Morse code, or by telephony (A3 or F3) using the English language.

9. The Commission further proposes to permit the use of A1 emissions for the transmission of ASCII coded communications on those Amateur Radio Service frequencies below 28 MHz where F1 emissions are permitted. This should provide greater operating flexibility with no adverse impact on existing operations.

10. The ARRL petition's request that maximum ASCII sending speeds on Amateur Radio Service frequencies between 50 MHz and 225 MHz be raised to 4800 baud is supported by its contention that "(u)nder some techniques, it should be possible for amateurs to transmit ASCII at 4800 baud, with a shift of 5440 Hertz, and produce a bandwidth well within the accepted norm (on VHF frequencies) of 16 kHz."5/ While the Commission agrees with the petition that this would encourage experimentation, we must be cautious to avoid allowing excessive interference to existing operations. Consequently, we propose to only limit sending speeds in those bands to approximately 19.6 kilobaud,

4/ The 1979 World Administrative Radio Conference specified new emission designators in order to more accurately account for sophisticated modulation techniques. These changes are pending treaty ratification and are currently a subject in the proceeding dealing with implementation of the Final Acts of the World Administrative Radio Conference, General Docket No. 80-739. Accordingly, no emission designators are specified in the text for operation using non-standard digital codes in conjunction with the various authorized modulation modes. Furthermore, it should be noted that the designators for conventional modes of operation are likely to change in the future.

5/ Emphasis added.

provided that such use shall produce a bandwidth no greater than 16 kHz. 6/ A maximum speed limitation equivalent to the highest speed permitted in any other bands is proposed in addition to the bandwidth limitation in order to help ensure our monitoring capabilities. Sixteen kilohertz would also be the maximum bandwidth of unspecified digital transmissions in the frequency bands between 50 MHz and 225 MHz by inference from paragraph 7 of this proposal.

11. Finally, the Commission proposes to replace the term "baud" in the rule section dealing with digital transmissions with the term "bits per second" or "bps." This is proposed in the interest of eliminating a somewhat ambiguous quantitative description currently used in the Rules. The "bits per second" description more accurately fulfills the Commission's intentions behind the rate limitation rules and aids in clarifying the regulatory requirements. This substitution should not have any adverse affect upon amateur operations.

Conclusion

12. NOTICE IS HEREBY GIVEN that it is proposed to amend 47 CFR Part 97 in accordance with the proposal set forth in the attached Appendix.

Procedural Matters

13. For purposes of this non-restricted notice and comment rule-making proceeding, members of the public are advised that ex parte contacts are permitted from the time the Commission adopts a notice of proposed rule making until the time a public notice is issued stating that a substantive disposition of the matter is to be considered at a forthcoming meeting or until a final order disposing of the matter is adopted by the Commission, whichever is earlier. In general, an ex parte presentation is any written or oral communication (other than formal written comments/pleadings and formal oral arguments) between a person outside the Commission and a Commissioner or a member of the Commission's staff which addresses the merits of the proceeding. Any person who submits a written ex parte presentation must serve a copy of that presentation on the Commmission's Secretary for inclusion in the public file. Any person who makes an oral ex parte presentation addressing matters not fully covered in any previously-filed written comments for the proceeding must prepare a written summary of that presentation; on the day of oral presentation, that written summary must be served on the Commission's Secretary for inclusion in the public file, with a copy to the Commission official receiving the oral presentation. Each ex parte presentation described above must state on its face that the Secretary has been served, and must also state by docket number the proceeding to which it relates. See generally, Section 1.1231 of the Commission's rules, 47 C.F.R. Section 1.1231.

6/ This bandwidth would be defined as those frequencies, outside of which each sideband emission has a power level which is 26 decibels below the power level of the total emission. This definition is consistent with that which was proposed in the proceeding dealing with revision of the Amateur Radio Service Rules into "plain language," PR Docket 80-729. It should be noted that this definition is not that given in the international Radio Regulations for either occupied bandwidth or necessary bandwith and only applies to this proposal.

A summary of the Commission's procedures governing ex parte contacts in informal rulemakings is available from the Commission's Consumer Assistance Office, FCC Washington, DC 20554, (202) 632-7000.

14. Authority for issuance of this Notice is contained in Sections 4(i) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i) and 303(r). Pursuant to applicable procedures set forth in Section 1.415 of the Commission's Rules, interested persons may file comments on or before January 15, 1982, and reply comments on or before February 15, 1982. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may take into consideration information and ideas not contained in the comments, provided that such information or a writing indicating the nature and source of such information is placed in the public file, and provided that the fact of the Commission's reliance on such information is noted in the Report and Order.

15. In accordance with Section 1.419 of the Commission's Rules, 47 C.F.R. 1.419, formal participante must file an original and five copies of their comments and other materials. Participants who wish each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of copies submitted. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, DC.

16. The Commission has determined that Sections 603 and 604 of the Regulatory Flexibility Act of 1980 (Public Law 96-354) do not apply to this rulemaking proceeding since this action is deregulatory in nature and since we would anticipate only a slight, insignificant impact on small businesses. This impact would be beneficial and would result from some amateur radio operators purchasing computer, radio, and related electronic equipment for experimentation authorized under this proposal. There would be no impact on small organizations or small governmental jurisdictions since the proposed rules in no way pertain to any such groups.

17. IT IS ORDERED that the Secretary shall cause a copy of this Notice to be served upon the Chief Counsel for Advocacy of the Small Business Administration and that the Secretary shall also cause a copy of this Notice to be published in the Federal Register.

18. For further information on this proceeding contact Steve Lett, Federal Communications Commission, Private Radio Bureau, Washington, DC 20554, (202) 632-7597.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

Attachment

A P P E N D I X

It is proposed that Section 97.69 of the Commission's Rules and Regulations, 47 CFR 97.69, be revised to read as follows:

§97.69 Digital transmissions.

Subject to the special conditions contained in paragraphs (a), (b) and (c) below, the use of the International Telegraphic Alphabet No. 2 (also known as the Baudot Code), the American Standard Code for Information Interchange (ASCII) and other digital codes may be used for such purposes as (but not restricted to) radio teleprinter communications, control of amateur radio stations, models and other objects, transfer of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such operation is carried out in accordance with the other regulations set forth in this Part.

(a) Use of the International Telegraphic Alphabet No. 2 (Baudot Code) is subject to the following requirements:

(1) Transmission shall consist of a single channel, five-unit (start-stop) teleprinter code conforming to the International Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The transmitting speed shall be maintained within five words per minute of one of the following standard speeds: 60, 67, 75 or 100 words per minute (45, 50, 56 or 75 bits per second, respectively).

(3) When frequency shift keying (type F1 emission) is utilized, the deviation in frequency from the mark signal to the space signal, or from the space signal to the mark signal, shall be less than 900 hertz.

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange as defined in American National Standards Institute (ANSI) Standard X3.4-1968.

(2) F1 emission shall be utilized on those frequencies between 3.5 and 28 MHz where its use is permissible; and the sending speed shall not exceed 300 bps (bits per second). A1 emission may also be used for ASCII where F1 is permitted; and the sending speed shall not exceed 300 bps.

(3) F1, F2 and A2 emissions may be utilized on those frequencies between 28 and 225 MHz where their use is permissible; and the sending speed shall not exceed 1200 bps.

(4) Sending speeds as great as 19.6 kbps (kilobits per second) may be utilized on those frequencies between 50 and 225 MHz provided that the bandwidth of such emissions does not exceed 16 kHz. (The bandwidth is defined as those frequencies, outside of which each sideband emission has a power level which is at least 26 decibels below the power level of the total emission.)

(5) F1, F2 and A2 emissions may be utilized on those frequencies above 225 MHz where their use is permissible; and the sending speed shall not exceed 19.6 kbps.

(c) Domestic use (communications between points within areas regulated by the FCC) of digital codes in addition to international Morse, Baudot or ASCII is permitted on all amateur frequencies above 50 MHz except those on which only A1 emission is permitted, subject to the following requirements:

(1) The bandwidth of an emission from a station using such digital codes shall not exceed 16 kHz on amateur frequencies between 50 and 225 MHz, and shall not exceed 40 kHz on amateur frequencies above 225 MHz. (The bandwidth is defined as those frequencies, outside of which each sideband emission has a power level which is at least 26 decibels below the power level of the total emission.)

(2) A description of the digital code shall be entered into the station log and provided to the Commission on request.

(3) Upon direction of the Commission or any Engineer-in-Charge of a Commission field facility, a station licensee shall:

(i) Cease the transmission of codes authorized under this paragraph.

(ii) Restrict the transmission of codes authorized under this paragraph to the extent instructed.

(iii) Maintain a record, convertible to plain language, of all coded transmissions authorized under this paragraph and the transmissions of the stations being communicated with.

Before the
Federal Communications Commission
Washington, D. C. 20554

PR
FCC 82-413
32009

In the Matter of	)	
	)	PR Docket No. 81-699
Use of Additional Digital Codes	)	RM-3788
in the Amateur Radio Service.	)	

REPORT AND ORDER
(Proceeding Terminated)

Adopted: September 14, 1982 Released: September 21, 1982

By the Commission

1. On October 1, 1981 the Commission adopted a Notice of Proposed Rule Making 1/ in the above-captioned matter proposing to allow amateur radio stations to use digital codes, other than those specified by the Commission, on amateur radio frequencies above 50 MHz. That Notice was in response to a petition for rule making, RM-3788 submitted by the American Radio Relay League, Incorporated (ARRL), which seeks amendment of the Amateur Radio Service Rules (Part 97) to provide for the use of any digital encoding technique in the amateur radio frequency bands above 50 MHz. Currently, the Rules only permit the use of the International Telegraphic Alphabet Number 2 (Baudot code) and the American Standard Code for Information Interchange (ASCII code). The comment period for the Notice ended January 15, 1982 and the reply comment period ended February 15, 1982.

2. In its Notice of Proposed Rule Making, the Commission specifically proposed to permit the transmission of digital codes, other than those defined in the Rules, on all amateur radio frequencies above 50 MHz, with the exception of those frequencies designated for A1 emissions only (50.0 - 50.1 MHz and 144.0 - 144.1 MHz). It was also proposed to limit communications using such codes to those between points within areas regulated by the FCC (domestic operation). Requirements that a station licensee include a description of the unspecified digital code in the station records and that the licensee, upon direction of the Commission, cease or restrict the use of the code, or maintain a record of coded communications, were also included in the proposal. In related areas, the Notice proposed to raise the maximum sending speed for ASCII coded communications from 1200 baud to approximately 19.6 kilobaud on amateur radio frequencies between 50 and 225 MHz; but it was also proposed to specify this higher speed, as well as all other sending

1/ 46 FR 50993, October 16, 1981.

speeds, in terms of "bits per second." The proposal included bandwidth specifications for transmissions of ASCII coded communications between 50 and 225 MHz, and for all transmissions of communications using unspecified digital codes. Finally, the Commission proposed to allow the use of A1 emissions for the transmission of ASCII coded communications on frequencies between 3.5 and 28 MHz.

3. Virtually all of the comments on the Notice support the Commission's proposal, however many suggest minor modifications. John A. Carroll, in his comments, quotes the following portion of the Commission's Notice: "We believe that other unspecified digital coding techniques may also lend themselves to digital voice, facsimile, and television communications. As such uses are not currently prohibited by the rules, the Commission does not see a need to restrict these uses for the unspecified digital codes." John A. Carroll's comment goes on to state that certain of these uses have "... enormous potential for improved communication, especially relay communication...." and that "... it would be well to add a few extra words (to the final rules) so that there is no doubt about (this) intent." Since the Commission desires to set forth the rules in the clearest possible manner and also desires to foster experimentation in the Amateur Radio Service, we are including such additional language in the final rules.

4. With regard to our proposal that communications using unspecified digital codes be limited to domestic operation only, the ARRL, petitioner in RM-3788, states in its comments, "There is at present a great deal of interest in linking together packet repeaters between Canada and the United States. The League would suggest that the final rules for additional digital codes provide that, should the governments of, for example, Canada and the United States specifically so agree, VHF or UHF digital communications across national borders shall be permitted." The Commission recognizes the potential desirability of such intercommunication and accordingly the final rules have been fashioned in such a way as to not preclude the use of unspecified digital codes across borders of consenting countries.

5. Several commenters express concern that the proposed rules allowing the Engineers-in-Charge (EICs) of field facilities to restrict the use of unspecified digital codes, or require maintenance of a record of the communications, might be imposed indiscriminately or without due consideration of the burden involved. The comments of the ARRL state, "While the need for this available sanction is manifest ... the practicality of compliance with such a sanction is of some concern. Conversion of a digitized image or voice transmission or the contents of a computer memory into plain language may be difficult to accomplish." The ARRL also expresses concern that "... the potential requirement that an amateur maintain a record ... of all coded transmissions from the station with which communication is established may be burdensome in certain cases." John A. Carroll's comments state that "... high speed digital communication could rapidly generate a large amount of communicated information, which, by Amateur standards, would be prohibitively costly to file." His comments also state that "(t)his is not to suggest that the provision shouldn't be there; (it would be) an important contribution to effective enforcement ... (but) it would be desirable to indicate how this authority is intended to be used."

6. The Commission is sympathetic to these concerns and we are including language in the final rules which states that the authority being granted to the EICs to limit unspecified coding, or require maintenance of a record, may only be invoked when "... necessary ... to assure compliance with the rules...." We are also deleting from the final rules the proposal that the EICs be authorized to require the recording of communications from a station with which communications are established using unspecified digital codes.

7. Also with regard to the authority the Commission proposed granting the EICs, the comments of Paul Newland state, "The proposal ... is well reasoned and more than fair ... (however it) doesn't include any recourse for the amateur who has been directed to cease (unspecifically coded) transmissions permanently. I would like to see a hearing (or some other process) as a next step in resolving ... a shut-down order." In fact, the appeal process which applies to virtually all Commission actions will also apply to this delegation of authority to the EICs. An amateur operator aggrieved by invocation of that authority may file an application for review or a petition for reconsideration of the action. 2/

8. The sentiment of the comments is unanimously against the Commission's proposal to replace the term "baud" in the rules limiting sending speeds, with the term "bits per second." Representative of this sentiment are the comments of Robert J. Carpenter which state, "If two bits are coded into a single time element (four level coding) the number of 'bits per second' is twice the number of 'bauds,' but the bandwidth occupied has not increased. I feel certain that the Commission intends to control the characteristic which relates to occupied bandwidth (bauds)...." Indeed, the Commission's interest is in maintaining spectrum efficiency through limitations on bandwidth. And since we do not want to close off "... a prime area of legitimate technical interest and experimentation by amateurs ..." 3/ we are going to continue to specify maximum sending speeds with the term "baud" so that amateur operators can utilize multi-level coding without incurring a sending speed penalty. We are adding a sending speed definition to the rules to make the Commission's intent in this area clear.

9. Several comments express a desire for the Commission to allow sending speeds greater than those proposed in the Notice for ASCII coded communications in the VHF 4/ and higher frequency bands. Those comments also request a commensurate increase in the bandwidth authorized for unspecified digital codes. The comments of Paul Newland suggest that techniques such as "Time-Division Multiplex (TDM)" could be used so that "... more users could benefit by allowing digital transmissions to occupy a bandwidth greater than the Commission had initially planned to allocate." The Amateur Radio Research and Development Corporation (AMRAD) states in its comments that "(t)he highest permissible ASCII sending speed and bandwidth should be raised to 56 kilobits per second and 100 kHz respectively in the 220.5 to 221.9 MHz subband to

2/ See Section 1.106 and 1.115 of the Commission's Rules; also Section 5, paragraph (d)(4), and Section 405 of the Communications Act of 1934, as amended.

3/ Comments of the American Radio Relay League, Incorporated.

4/ The Very High Frequencies (VHF) are those between 30 and 300 MHz.

permit packet switching network operations in that subband." The reply comments of the ARRL state, "The League shares the concerns of Messrs. Rinaldo (for AMRAD) and Newland, and suggests that the Commission increase permissible bandwidths for digital transmissions at and above 220 MHz."

10. The Commission appreciates the desire of the amateur community to experiment and operate with state-of-the-art digital technology. Therefore, in order to avoid hampering these endeavors we are authorizing greater ASCII sending speeds and the use of wider bandwidths for unspecified coded transmissions. We are authorizing a sending speed as great as 56 kilobaud and a bandwidth as great as 100 kHz in accordance with the request of AMRAD; however, in order to permit the greatest flexibility in spectrum utilization, we are going to permit this speed and bandwidth on all frequencies above 220 MHz rather than limiting them to the frequencies between 220.5 and 221.9 MHz. Furthermore, the final rules will allow the use of any bandwidth on frequencies above 1215 MHz rather than imposing a limitation as was proposed in the Notice. The Commission is also not adopting the bandwidth restriction proposed for transmissions of ASCII coded communications on frequencies between 50 and 225 MHz, using sending speeds between 1200 and 19600 bits per second. Instead we will allow a maximum sending speed on the frequencies between 50 and 220 MHz of 19.6 kilobaud without a bandwidth restriction. The maximum speed of 56 kilobaud will apply to the frequencies between 220 and 225 MHz as discussed earlier. We are raising the permissible bandwidth for transmissions of unspecifically coded communications between 50 and 220 MHz from 16 kHz to 20 kHz in order to fit more closely our desire to equate these emissions with the ones currently used in those bands.

11. The Commission is also including some other minor changes in the final rules regarding sending speed and bandwidth. We are revising our bandwidth definition to eliminate certain ambiguities in the definition we proposed in the Notice. We wish to emphasize that this definition does not imply, nor do we intend to require, that amateur radio operators continuously monitor their emission bandwidth while using the digital codes which subject the station transmissions to bandwidth limitations. We only require that operators comply with the bandwidth requirements. Operators may determine compliance through electronic, mathematical or any other means they deem sufficient. We are also eliminating the requirement that stations using the Baudot code maintain the sending speed within certain tolerances. Currently, the sending speed must be maintained within 5 words per minute of the standard speeds (60, 67, 75 or 100 words per minute). However, that requirement no longer serves any regulatory purpose since electronic rather than electro-mechanical teleprinter equipment is now commonly used and the newer equipment is less sensitive to variations in sending speed.

12. As another minor change, the Commission is authorizing the use of A1 emissions for ASCII coded communications on all frequencies where F1 emissions are permitted. We had proposed to limit the use of A1 emissions for ASCII coding to the frequencies below 28 MHz, however we can find no reason not to permit this additional mode in the bands above 28 MHz as well. A small amendment to the rules regarding operator privileges is being added to preclude the use of ASCII coded communications by Novice class and Technician class operators using frequencies below 28.2 MHz. This represents no change in privileges for these operators.

13. Finally, with regard to the authorization of unspecified digital codes, concern was expressed in the Commission's Notice that such an authorization could affect "... our ability to monitor coded transmissions for content, as well as the ability of the amateur community to monitor transmissions from individual stations for the purpose of self-enforcement." In response to this concern the comments of the ARRL state the following:

> The League is sympathetic to, and generally shares the Commission's reservations about any reduction in the Commission's ability to monitor coded transmissions for content, or the amateur's ability to monitor for purposes of self-enforcement. A combination of several factors should be sufficient to minimize the potential for abuse, however. First, the primarily local nature of communications on the VHF and UHF frequencies involved should limit the potential ability of unscrupulous business users to utilize the amateur bands to transmit data of a commercial nature, circumventing existing common carriers. Second, the vigor with which amateurs protect their allocated frequency bands against unauthorized interlopers, together with well-polished direction finding techniques, will in most cases result in investigation by amateurs of the source of repeated unusual or suspicious digital transmissions. The requirement of open identification procedures is a significant litmus for distinguishing legitimate amateur use from unlawful misuse of amateur frequencies. Finally, the provisions of proposed Rules Section 97.69(c)(3) permit the Commission to take immediate action against a station suspected of unlawful misuse of the amateur bands via unspecified digital codes by ordering the cessation of the use of such codes. The above factors, together with the traditionally superlative level of rule compliance by amateurs, should be sufficient to offset the League's concern and that of the Commission with respect to potential misuse of digital codes.

We have considered this matter at great length. In balancing our objectives of encouraging new technologies against assuring our enforcement capability, it must be recognized that there is an incompatibility between authorizing experimentation with "exotic" technologies and the employment of channel monitoring as an enforcement tool. Our ability to verify that the content of messages complies with our rule requirements will be hindered by the broad relaxation of regulatory constraints that we are ordering in this proceeding. However, the Commission finds itself in agreement with the ARRL that special provisions we are including in the final rules, as well as existing provisions that identification be made in plain English or the international Morse code, should, when combined with the zealous effort of the amateur community to protect their allocated frequency bands, provide adequate protection against unauthorized operation in the service.

14. Accordingly, IT IS ORDERED that effective October 28, 1982, Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, IS AMENDED as set forth in the attached Appendix. IT IS FURTHER ORDERED that to the extent specified herein, RM-3788 IS GRANTED, and in all other respects it IS DENIED. IT IS FURTHER ORDERED that this proceeding IS TERMINATED. This

action is taken pursuant to authority contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended. In accordance with the Paperwork Reduction Act of 1980 (Public Law 96-511, December 11, 1980), the Commission will forward a copy of the final rules herein promulgated to the Associate Director for Information and Regulatory Affairs of the Office of Management and Budget. Further information on this matter may be obtained by contacting: Steve Lett, (202) 632-4964, Private Radio Bureau, Federal Communications Commission, Washington, DC 20554.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

APPENDIX

Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, is amended as follows:

1. In Section 97.7, paragraph (e) is revised to read as follows:

§ 97.7 Privileges of operator licenses.

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(e) Novice Class. Radiotelegraphy in the frequency bands 3700-3750 kHz, 7100-7150 kHz (7050-7075 kHz when the terrestrial station location is not within Region 2), 21,100-21,200 kHz, and 28,100-28,200 kHz, using only type A1 emission and using only the international Morse code.

2. Section 97.69 is revised to read as follows:

§ 97.69 Digital communications.

Subject to the special conditions contained in paragraphs (a), (b) and (c) below, an amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements or other information. These digital codes may be used for such communications as (but not limited to) radio teleprinter, voice, facsimile, television, communications to control amateur radio stations, models and other objects, transference of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such digital codes are not intended to obscure the meaning of, but are only to facilitate, the communications, and further provided that such operation is carried out in accordance with other regulations set forth in this part. (For purposes of this section, the sending speed (signaling rate), in baud, is defined as the reciprocal of the shortest (signaling) time interval (in seconds) that occurs during a transmission, where each time interval is the period between changes of transmitter state (including changes in emission amplitude, frequency, phase, or combination of these, as authorized).)

(a) Use of the International Telegraphic Alphabet No. 2 (Baudot code) is subject to the following requirements:

(1) Transmission shall consist of a single channel, five unit (start-stop) teleprinter code conforming to the International Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in the "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The sending speed shall not exceed 100 words per minute (75 baud).

(3) When frequency (or phase) shift keying (type F1 emission) is utilized, the deviation from the mark signal to the space signal, or from the space signal to the mark signal, shall be less than 900 hertz.

(4) When audio frequency shift keying (type A2 or F2 emissions) is utilized, the highest fundamental modulating frequency shall not exceed 3000 hertz, and the difference between the modulating audio frequency for the mark signal and that for the space signal shall be less than 900 hertz.

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange as defined in American National Standards Institute (ANSI) Standard X3.4-1968.

(2) F1 emission shall be utilized on those frequencies between 3.5 and 29 MHz where its use is permitted; and the sending speed shall not exceed 300 baud.

(3) F1, F2 and A2 emissions may be utilized on those frequencies above 28 MHz where their use is permitted; and the sending speed shall not exceed the following:

(i) 1200 baud on frequencies between 28 and 50 MHz;

(ii) 19.6 kilobaud on frequencies between 50 and 220 MHz;

(iii) 56 kilobaud on frequencies above 220 MHz.

(4) A1 emission may be used for ASCII where F1 is permitted; and the sending speed shall not exceed that specified for other ASCII coded emissions on the same frequency.

(c) In addition to the above provisions, the use of any digital code is permitted on amateur frequencies above 50 MHz, except those on which only A1 emission is permitted, subject to the following requirements:

(1) Communications using such digital codes are authorized for domestic operation only (communications between points within areas where radio services are regulated by the U.S. Federal Communications Commission), except when special arrangements have been made between the United States and the administration of any other country concerned.

(2) The bandwidth of an emission from a station using such digital codes shall not exceed the following (where for this purpose the bandwidth is defined as the width of the frequency band, outside of which the mean power of any emission is attenuated by at least 26 decibels below the mean power of the total emission; a 3 kHz sampling bandwidth being used by the FCC in making this determination):

(i) 20 kHz on frequencies between 50 and 220 MHz;

(ii) 100 kHz on frequencies between 220 and 1215 MHz;

(iii) On frequencies above 1215 MHz any bandwidth may be used provided that the emission is in accordance with §97.63(b) and §97.73(c).

(3) A description of the digital code and the modulation technique shall be included in the station log during all periods of use and shall be provided to the Commission on request.

(4) When deemed necessary by an Engineer-in-Charge of a Commission field facility to assure compliance with the rules of this part, a station licensee shall:

(i) Cease the transmission of digital codes authorized under this paragraph.

(ii) Restrict the transmission of digital codes authorized under this paragraph to the extent instructed.

(iii) Maintain a record, convertible to the original information (voice, text, image, etc.), of all coded communications transmitted under authority of this paragraph.

WILLIAM E. SCHOLTZ
9407 GOOD LUCK ROAD
SEABROOK, MARYLAND 20801

Before the
FEDERAL COMMUNICATIONS COMISSION
Washington, D.C. 20554

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Comments of W. Scholtz in Response to	)	
	)	
Use of Additional Digital Modes in	)	RM-3788
the Amateur Radio Service	)	

PLEASE ADOPT PETITION RM-3788 AS SOON AS POSSIBLE. If the following suggestions do not hinder the time table for expeditious adoption of the otherwise unmodified petition, then please consider the following suggestions. They will aid in decreasing the quantity of future applications for Special Temporary Authority (STA) when preliminary experimentation in "packet switching" techniques is implemented. Packet switching is presented as one of the applications on page 5 of petition RM-3788.

By using a digital type of radio repeater modulation, the radio amateurs in Montreal are now, and soon other Canadian locations will be using the 220 to 225 MHz band. All input and output modulation of the repeater is in digital packets. Each packet of information lasts less than one second. Each packet has a protocol encompassing to and from addresses for station identification. This type of automatic identification should be applicable to all new classes of general public radio services, including the inland marine request 80-1 still pending.

The Montreal packet repeater system is constructed to easily increase its digital speed proportional to future volume of usage to a 38.4 kilobaud rate. Therefore, this rate in a digital repeater is requested for similar experimentation throughout the Unites States and its possessions. Meteor scatter propagation may be possible to allow long distance UHF communication with the fractional second bursts of digital packets.

In addition, an STA is pending to experiment with spread spectrum techniques. A follow-on experiment could be the solution to the lack of dicipline. Reducing susceptibility of a digital repeater to malicious jamming is possible with spread spectrum techniques integrated into a packet repeater. To accommodate some spread spectrum, consistant with off-the-shelf receiver IF components for the FM broadcast industry bandwidths of 180 kHz, please permit the bandwidths to be several times wider than the normal width for the corresponding baud rate.

WILLIAM E. SCHOLTZ
9407 GOOD LUCK ROAD
SEABROOK, MARYLAND 20801

Accordingly, please permit 180F9 emissions to allow several channels in a repeater output subband from 220.7 to 221.1 MHz. Also, please allow a single 180F9 or several smaller bandwith channels between 223.65 and 223.83 MHz for repeater inputs of 38.4 kilobaud signals or slower baud rates.

William Scholtz

William Scholtz W3HXF